Installation & Operational Manual

For

GLI-COBRA

GPS Retransmission System

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1.0 Introduction

The GLI-COBRA is a Roll-on/Roll-off GPS Re-transmission System that provides GPS signals inside of an aircraft in support of modern GPS guided Precision Airborne and Airdrop missions. The GLI-COBRA system is compatible with any small to large transport aircraft and ground vehicles, including the: CASA, all variants of the C-17, C-130, CH-47, CH-53, C-27, and H-60. When installed in a vehicle, the GLI-COBRA provides reliable GPS coverage throughout the entire cargo compartment on smaller aircraft/vehicle and optional localized coverage on larger aircraft/vehicle, allowing any carry on military or commercial GPS receiver to operate inside the aircraft. With the GPS Retransmission System installed, the GPS guidance units can acquire satellite signals inside the aircraft negating the prolonged “time to first fix” delay upon deployment of the payload or airborne soldier. The system features 100% BIT coverage allowing each hardware component to be monitored, confirming that the system is fully operational and providing complete system fault isolation to the item level in the event of a system failure. In addition the system provides verification of the GPS signal’s strength, quality, and coverage allowing the aircrew to focus on the critical mission at hand. GLI-COBRA is packaged in a rugged portable case that can stand up to any demanding military mission.

2.0 System Description

The GLI-COBRA GPS Retransmission System Signal Conditioner receives the composite L1/L2 GPS signal from the either the host aircraft’s GPS antenna system, or from a 2.6” active antenna that is included in the kit and that is usually placed on the flight deck. The Signal Conditioner Line Replaceable Unit (LRU) filters, amplifies, monitors, and distributes the L1/L2 GPS signal throughout the aircraft. The signal is distributed by way of a coaxial cable and retransmission antenna network. The antenna network includes up to 4 retransmission channels.

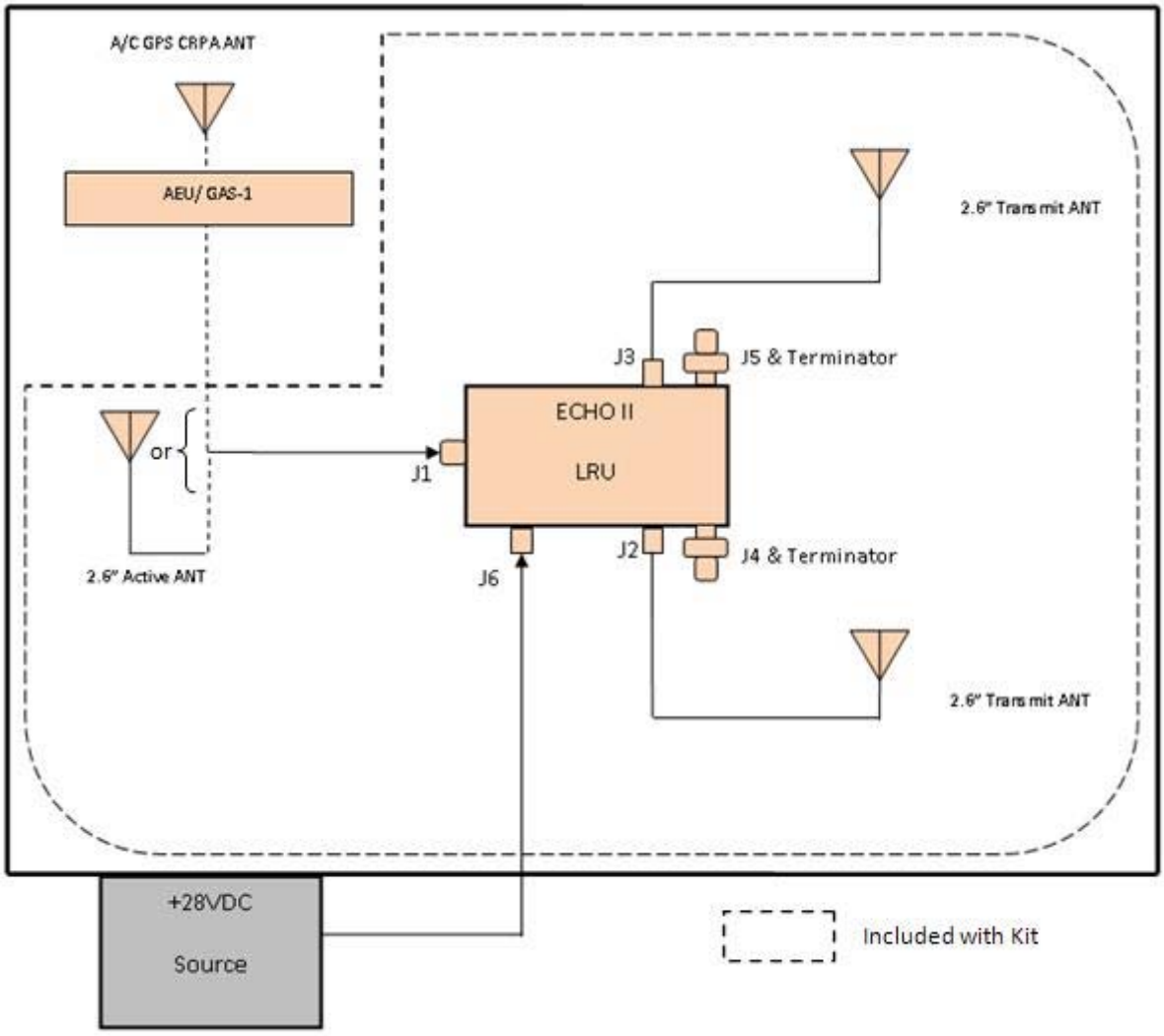


Figure 1. GLI-COBRA GPS Retransmission System Block Diagram

2.1 Component List

The GLI-COBRA GPS Retransmission System consists of the following system components:

- Signal Conditioner (SC) (1 ea.)
- GPS Retransmission Antennas (2 ea.)
- Signal Conditioner Output Terminators (4 ea.)
- GPS Receive Antenna (2 ea.)
- Mounting Hardware
  - Passive Antenna Adjustable Hinge Mount (2 ea.)
  - Receive Antenna Adjustable Hinge Mount (1 ea.)
  - Receive Antenna Universal Mount Plate (1 ea.)
  - Universal Foam Mount Adapter (2 ea.)
  - Universal Velcro Mount Adapter (3 ea.)
  - Universal Magnetic Mount Adapter (2 ea.)
  - ECHOII Universal Velcro Mount Adapter (1 ea.)
  - ECHOII Universal Foam Mount Adapter (1 ea.)
  - ECHOII Universal Magnetic Mount Adapter (1 ea.)
  - ECHOII Universal Adapter Mount plate with fasteners (1 ea.)
  - Nylon Mounting Strap (3 ea.)
- Signal Conditioner Input Coaxial Cable (1 ea.)
- Receive Antenna Output Coaxial Cable (2 ea.)
- Transmit Antenna Input Coaxial Cable (2 ea.)
- Signal Conditioner Output Coaxial Cables (2 ea.)
- BA5590 Power Cable with Velcro securing strap (1 ea.)
- Optional Equipment
  - C130 Power Cable 28VDC
  - C-17 Power Cable 28VDC

The GLI-COBRA kit may be ordered with, or upgraded to, the “Additional Two Antenna” option, bringing the total number of retransmission antennas in the kit to four. This enables 100% coverage of the cargo compartment in larger aircraft, such as the C-130J or the C-17A. The “Additional Two Antenna” option includes the following additional systems components:

- GPS Retransmission Antennas (2 ea.)
- Transmit Antenna Input Coaxial Cable (2 ea.)
- Signal Conditioner Output Coaxial Cables (2 ea.)
- Mounting Hardware
  - Passive Antenna Adjustable Hinge Mount (2 ea.)
  - Universal Foam Mount Adapter (2 ea.)
  - Universal Velcro Mount Adapter (2 ea.)
  - Nylon Mounting Strap (2 ea.)

2.2 Kit Contents

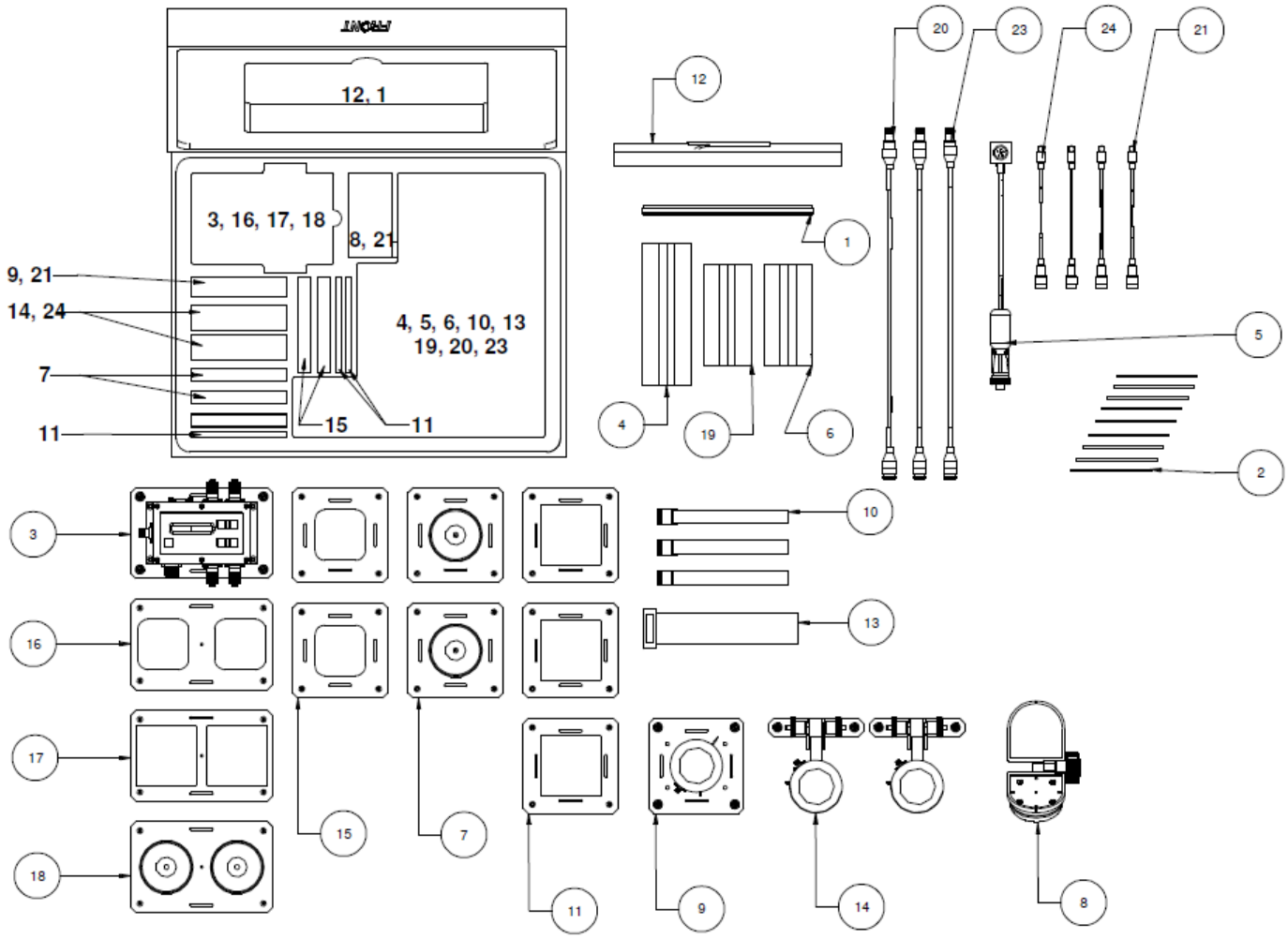


Figure 2: GLI-COBRA Kit Contents

Table 1: GLI-COBRA Kit Contents

Item	Qty	Item	Qty
1. User's Guide	1	**13.** Velcro Strap w/ D-ring for securing BA5590 power cable, 1" x 21"	1
2. One wrap velcro, 3/4" X 2"	9	**14.** L1/L2 passive 2.6" antenna on adjustable antenna hinge	2
3. ECHO II on Universal Mount Plate	1	**15.** Universal adapter mount plate with foam	2
4. Plastic tie wrap 11.3" x 4 dia. 120 tensile UV black (50 pcs)	1	**16.** Echo II mount plate with foam	1
5. Power cable, mil conn (F) to BA5590 (fused)	1	**17.** Echo Mount Plate w/ velcro	1
6. Zip lock back for velcro (hook & loop) (50 pcs)	1	**18.** Echo Mount Plate w/ magnets	1
7. Universal Adapter mount plate with magnet	2	**19.** Zip lock bag for velcro "fuzzy side" fasteners (25pcs)	1
8. 2.6" Antenna L1/L2 Active Antenna Ava. Grd. on Antenna Hinge Mount	1	**20.** Cable assembly 30 ft TNC(F) to TNC(M) RG58, Echo II output (green)	2
9. 2.6" Antenna L1/L2 Active Antenna Ava. Grd. on Universal Mount Plate	1	**21.** Cable assembly 12 ft TNC(M) to right angle SMA(M) RG316	2
10. 1 inch by 8 in black strap with clip buckle, flat nylon	3	**22.** Case, Pelican 1550 w/ foam inserts	1
11. Universal Adapter mount plate with velcro	3	**23.** Cable assembly, 30 ft TNC(F) to TNC(M), RG-58, Echo II input (blue)	1
12. User Guide Folder	1	**24.** Cable assembly 3ft TNC (M) to right angle SMA (M) RG316	2

2.3 Signal Conditioner

The GPS Retransmission System (RS) Signal Conditioner (SC) is the primary LRU of the GPS Retransmission System. The Signal Conditioner receives the L1 and L2 GPS signals from the 2.6" "Active Antenna usually placed on the flight deck. The SC then amplifies the GPS signals and distributes them to the retransmission system antennas located throughout the aircraft cargo compartment and crew rest area. The Signal Conditioner is shown in the figure 2 below:

Figure 3. The GLI-ECHOII GPS Retransmission System Signal Conditioner (SC)

The GPS RS SC performs the following basic functions:

Amplifies the signals: The SC amplifies the GPS signals to a level for retransmission from the RS antennas that are sufficient for complete signal coverage throughout the cargo compartment.

Employs Power Control: The SC employs a power control function which measures the output power of the GPS signals, from the SC, and controls the gain to ensure the necessary radiated power level is achieved within the aircraft cargo compartment.

Distributes signals: The SC divides the GPS L1 and L2 signals evenly over the four outputs for distribution to the retransmission antennas located in the cargo compartment. The number of retransmission antennas required for complete signal coverage in the cargo compartment depends on the size of the aircraft.

Performs Built In Test (BIT): The SC performs a continuous built in test function, monitoring the status of coaxial cables to and from the SC, as well as the GPS signal levels and signal quality within the SC itself.

Provides diagnostic port: The SC has a diagnostic port that can be monitored by way of a laptop computer RS232 port in order to test and determine the status of the system.

Provides real-time status signal: The SC provides a status signal (XMIT or FAULT) to the Enunciator LEDs on the SC LRU faceplate.

Receives power: The SC receives 28VDC from a standard military BA5590 battery, or the system may be powered by way of aircraft 28VDC power outlets (if that option is requested).

2.4 GPS Retransmission Antennas

The retransmission antennas receive the L1/L2 GPS signals from the GPS SC and transmit the GPS Signal in the cargo compartment of the host aircraft.

The retransmission antennas also include custom circuitry to enable the SC to monitor the operational status of the individual antennas.

Figure 4. GLI-COBRA GPS Retransmission Antenna

2.5 Signal Conditioner Output Terminators

In smaller aircraft, all of the SC retransmission channels are not required. When output channels are not used, the unused outputs must be terminated so as to avoid false BIT indications. The GLI-COBRA GPS Retransmission Kit includes the output terminators (already installed) for this purpose.

Figure 5. Signal Conditioner Output Terminators (Design may vary)

2.6 GPS Receive Antenna

In order to achieve the best system performance, it is highly recommended that the GLI-COBRA system receive the L1 and L2 GPS signals from the aircraft's GPS antenna system (e.g. via the AEU/GAS-1 MCR output). In the event that the aircraft is not equipped with an available GPS signal source, the GLI-COBRA kit includes a GPS receive antenna on a suction-cup hinge mount that may be mounted behind the windscreen on the flight deck. This antenna should be positioned so as to avoid interference with the flight crew and to make as much of the open sky visible to the receive antenna as possible.

Note: Positioning of the GPS receive antenna behind the windscreen on the flight deck may result in a significant reduction in visibility of GPS satellites if not properly oriented. Consequently, system performance may be severely reduced. Installation of the GPS receive antenna should not interfere with crew movement or safety.

Figure 6. GPS Receive Antenna

2.7 Mounting Hardware

The GLI-COBRA GPS Retransmission Kits come standard with various antenna mounting brackets, Velcro and nylon straps for ensuring safe, easy installation of the system.

3.0 Input Power Requirements

The SC receives 28VDC from a standard military BA5590 battery. The kit includes a standard custom power cable for the BA5590 battery. Optional 28VDC Aircraft power cables are also available for C-130 variants and the C-17.

Figure 7. GLI-COBRA 28VDC BA5590, A/C 28VDC C-130/C-17 Power Cables

4.0 GPS Input Signal Requirements

The Signal Conditioner (SC) receives the L1 and L2 GPS signals via the J1 input from the either the aircraft's GPS receive antenna or from the GPS Receive Antenna included with the kit. In order to achieve the best system performance, it is highly recommended that the system receive the L1 and L2 GPS signals from the aircraft's GPS antenna system (e.g. via the AEU/GAS-1 MCR output).

In the event that the aircraft is not equipped with an available GPS signal source, the Signal Conditioner may GPS signals from the GPS receive antenna included with the kit. This antenna should be positioned so as to make as much of the open sky visible to the receive antenna as possible.

Note: Positioning of the GPS receive antenna behind the windscreen on the flight deck may result in a significant reduction invisibility of GPS satellites if not properly oriented. Consequently, system performance may be severely reduced. Installation of the GPS receive antenna should not interfere with crew movement or safety.

5.0 Signal Conditioner Mounting Requirements

The GLI-COBRA SC LRU should be mounted at a location where it can be securely tied down and out of the way of aircrew and passengers. The Velcro mounting plate may be used to secure the SC to inside of the aircraft. Alternatively, the foam mounting plate together with the Nylon straps may be used to secure the SC in the aircraft. Follow the instructions below for proper installation.

6.0 Installation Instructions

The following sections contain detailed installation instructions for the specific aircraft variants of the CASA-212

6.1 CASA Installation Instructions

Below illustrates the general system installation for CASA aircraft variants. The GPS Repeater receives GPS signals from the dash or windscreen mounted 2.6" L1 Active Antenna. The Repeater re-transmits the GPS signal throughout the cabin area of the aircraft.

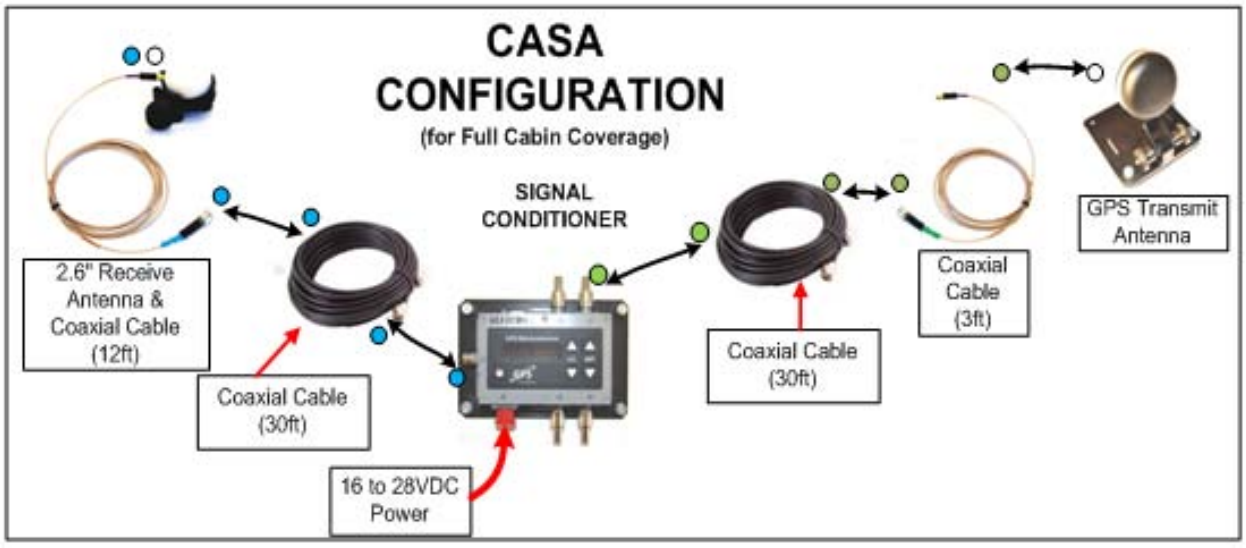


Figure 8: GLI-COBRA CASA GPS Retransmission System Configuration

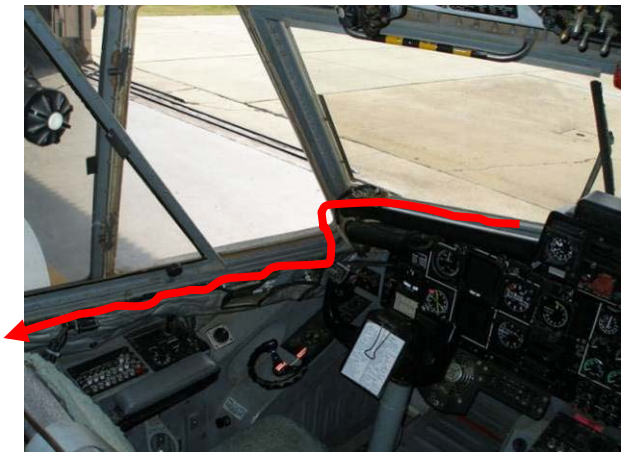
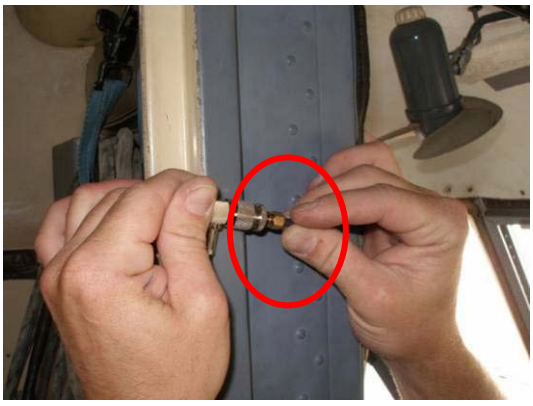
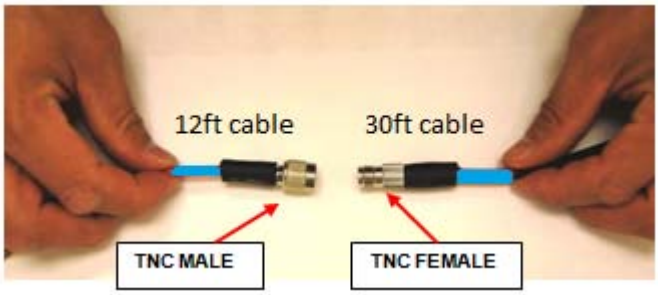
The following sections contain detailed installation instructions for the CASA aircraft.

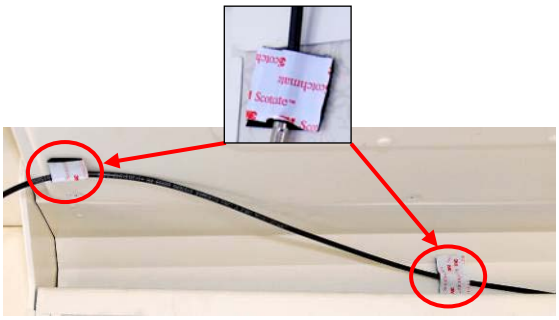
NOTE: System Voltage Requirements

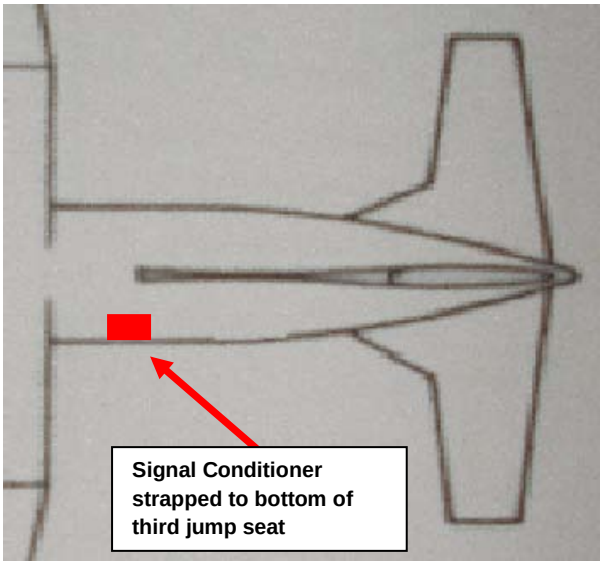
1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28VDC nominal)

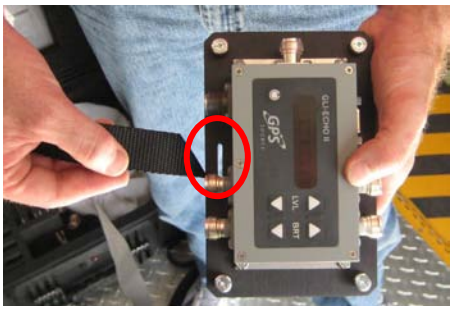
2.) The 2.6" L1/L2 Active Antenna operates on 5 VDC supplied by the SC

Step	Instruction	
1.0		Prepare the 2.6” Antenna for installation on flight deck. Adjust the Antenna hinge mount thumb knob counterclockwise until both plates are loose. Position the suction cup plate, and Antenna plate so that they create an up-side-down “V”. Re-tighten the thumb knob clockwise to lock in place.
WARNING: Ensure the chosen location for the 2.6” Antenna hinge mount and cable will not impede crew visibility or flight controls, and exits.		
2.0		Moisten suction cups prior to installation. Position the Antenna hinge mount on the left windscreen at the lowest point just above and to the left of the dashboard. Press suction cup plate firmly against windscreen. Ensure the Antenna is pointing upward.
3.0		Loosen the thumb knob and adjust the angle of the Antenna. The Antenna should be oriented upwards, and nearly parallel to the windscreen. This ensures the Antenna views as much of the sky as possible. Re-tighten the thumb knob until the Antenna plate is secure.

Step	Instruction	
4.0		**Cable Routing:** Route the cable in- between the Antenna hinge mount and along the dashboard to the left. Continue cable routing along left side window and behind the pilot's seat, and along the crew bulkhead. Use cable ties and Velcro strips as needed. The connector with the TNC(F) end should be towards the rear of the aircraft.
5.0	 	**Cable Routing:** Continue routing the Antenna cable through the crew doorway and along the backside of the crew bulkhead. Secure the cable with the cable ties or Velcro strips. Once the Antenna cable has reached its maximum length, connect it to the 30ft black RF cable. Connect the blue TNC(M) end of the 12ft Antenna cable with the blue TNC(F) end of the 30ft RF cable as shown. Note: The connector on the 12ft Antenna cable end will be TNC (M), and the connector on the 30ft RF cable end will be TNC (F).

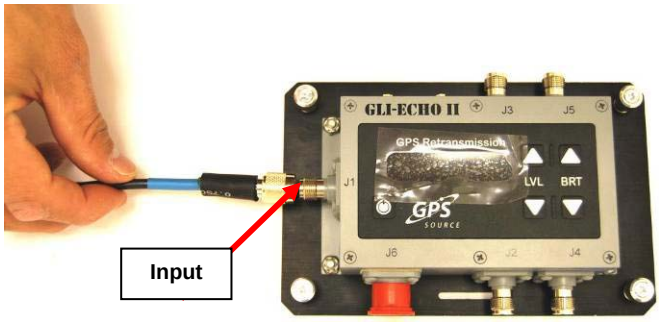
Step	Instruction	
6.0	 	**Cable Routing:** Route the 30ft black RF cable along the back side of the crew bulkhead towards the left side of the plane. Continue routing the RF cable above front crew exit door and towards the rear of the cargo compartment. Secure the RF cable with the Velcro strips provided. Ensure the RF cable does not block the exit door or the cable does not get pinched. When using the Velcro strips space them every 1 to 2 feet. Use more as necessary.
7.0		**Cable Routing:** Continue routing the RF cable rearward along the left upper side of the cargo compartment as shown. Secure the RF cable with the provided cable ties or Velcro strips.
8.0	**Cable Routing:** Route the RF cable over the front side of the third jump seat then straight down. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner.	

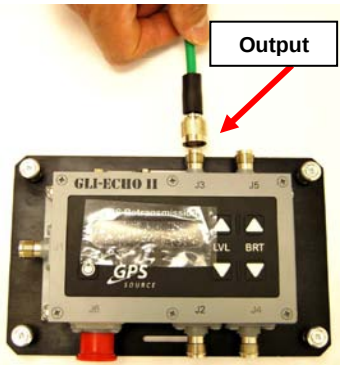
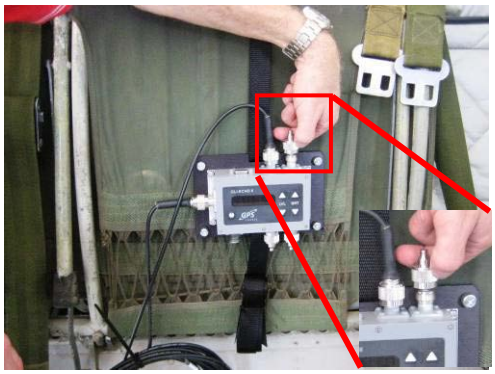
Step	Instruction	
9.0		**Signal Conditioner Installation:** Take the third jump seat at the rear of the aircraft, left side, and place it in the upright position. Securely fasten it with available hardware. *Ensure that the location chosen will not interfere with crew movement or equipment.*
10.0	 	**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners.

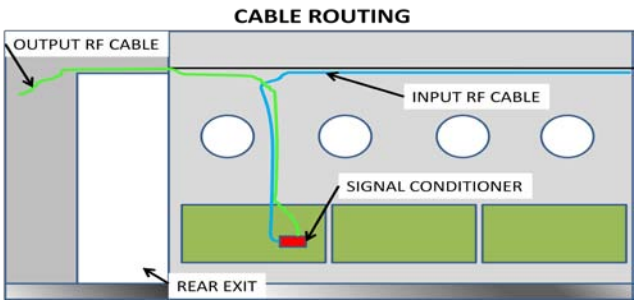
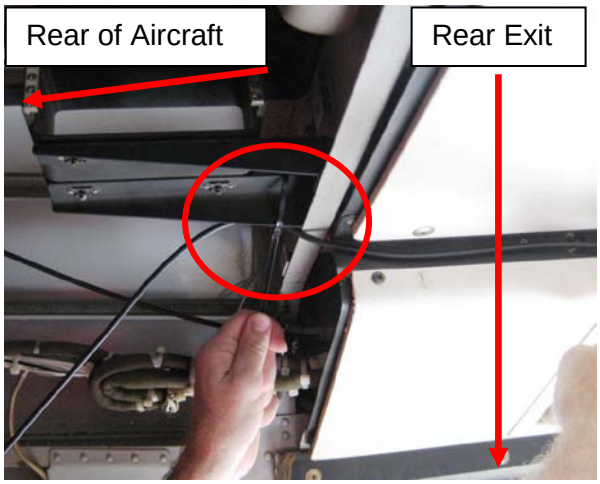
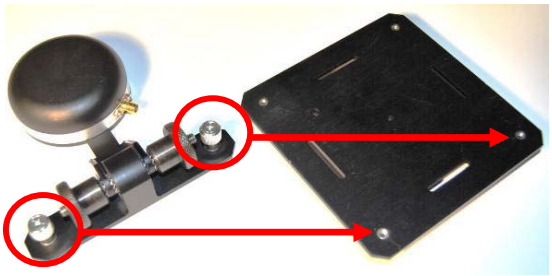
Step	Instruction	
11.0	 	**Signal Conditioner Installation:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.
12.0		**Signal Conditioner Installation:** To attach the SC wrap the loose end of the Nylon strap around the jump seat from the top until it hangs over the back. Ensure the SC is flat against the bottom of the seat and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

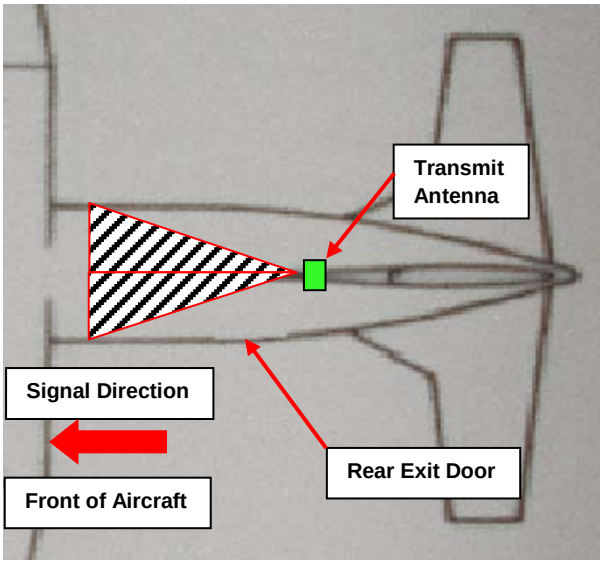
Step	Instruction	

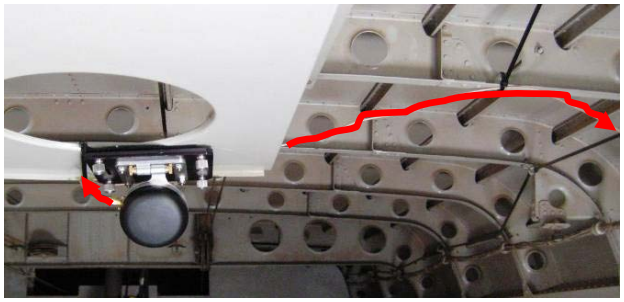
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

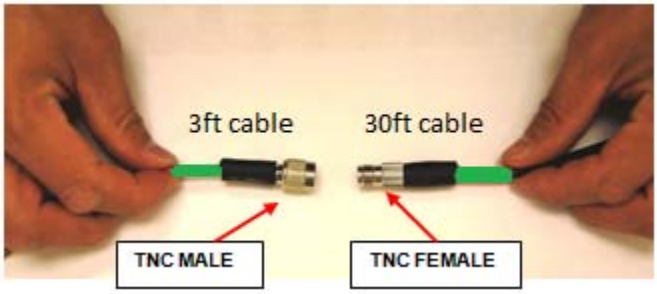
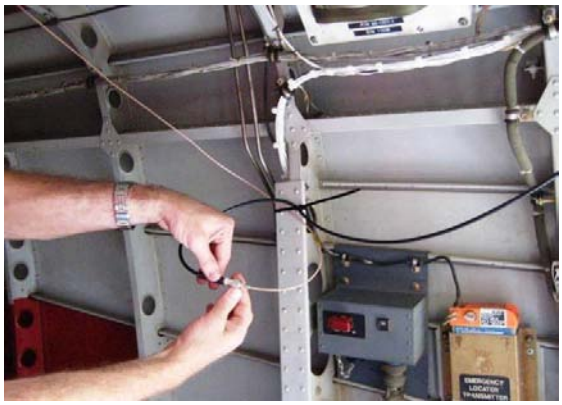
13.0	 	**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF cable to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

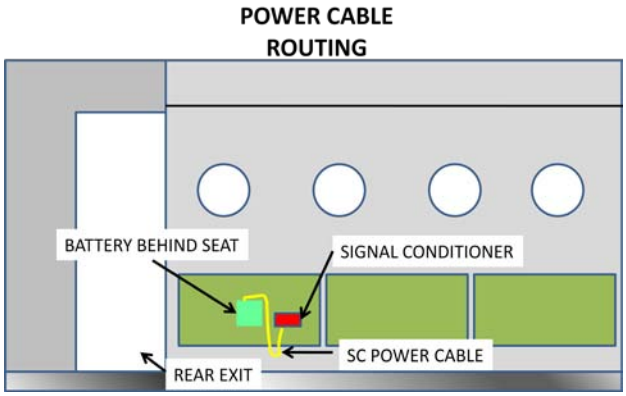
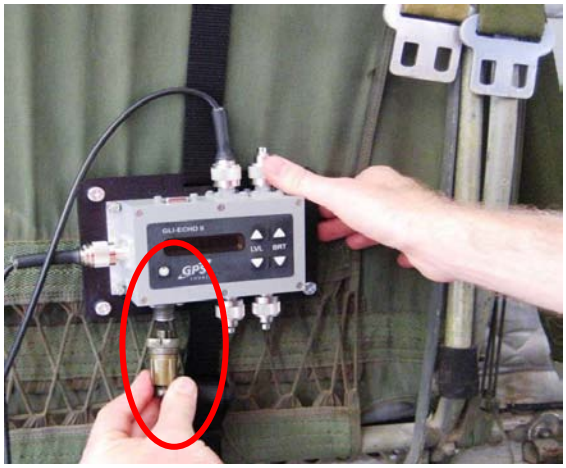
Step	Instruction	
14.0	 	**Connect Output Cable:** Unscrew the RF load(s) on the output (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** Connect the green TNC(M) 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). Once more ensure all loads are on the unused outputs.
15.0		**Cable Routing:** Route the SC output RF cable over the front side of the third jump seat then straight up to the upper side of the cargo compartment.

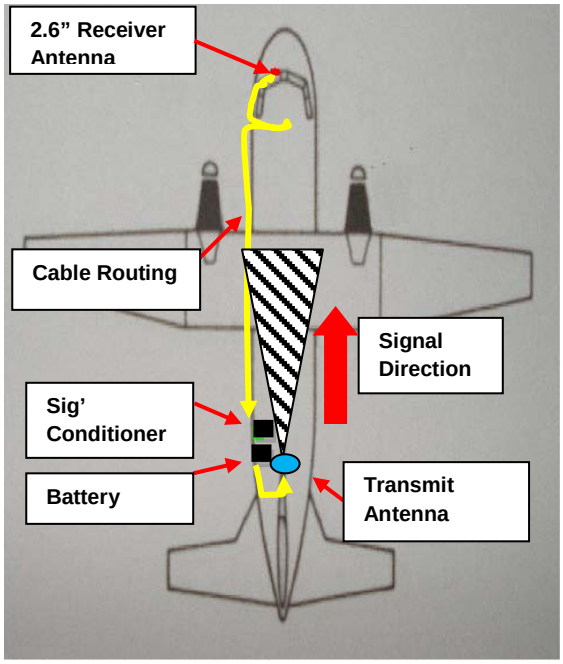
Step	Instruction	
	 	Once at the upper side of the cargo compartment route the RF cable towards the rear of the aircraft and over the rear exit door. Secure the RF cable using zip ties and Velcro strips.
16.0	 	**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. If the 3ft cable is not already connected to the antenna, then connect the 3ft SMA(m) green cable end to the transmit antenna. (not shown in photo)

Step	Instruction	
17.0	 	**Install Transmit Antenna Cont'd:** Install the provided fuzzy side velcro patch onto the cargo compartment ceiling, right above the start of the aircraft ramp.
18.0		**Install Transmit Antenna Cont'd:** Install the transmit antenna with adjustable hinge by firmly pressing it against the velcro patch located on the ceiling.

Step	Instruction	
19.0		**Install Transmit Antenna Cont'd:** Adjust the transmit antenna position, using the adjustment knobs, so that it is approximately 70 degrees, and facing the front of the aircraft. Once positioned ensure the knobs are securely tightened, or the position of antenna may change, and degrade system performance.
20.0	 	**Cable Routing:** Route the transmit antenna cable through the airframe towards the rear exit door, and the previously installed 30ft cable.(green) Secure the Transmit antenna cable with zip ties where appropriate.

Step	Instruction	
WARNING: Do not secure antenna cable to aircraft linkages or mechanical pulley cables!		
21.0	 	**Cable Routing:** Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cable and 30ft cable with zip ties. Any excess cable should be neatly coiled and secured out of the way.
22.0	 	**Install BA5590 Battery:** Connect the BA5590 Battery cable to the BA5590 battery. Secure the power cable to the Battery using the large velcro strap that has the buckle. The power cable should be placed between the pieces of interlocking Velcro.

Step	Instruction	
23.0		**Cable Routing-Power:** Place the BA5590 Battery, with the power cable attached, behind the third jump seat where the SC is located. This will help in preventing damage to the aircraft, and interferences with crew movement.
24.0		**Connect the Power Cable to the Signal Conditioner:** Feed the power cable down through the folded up jump seat, and up around the front side where the SC is located. Secure the excess power cable by coiling up and using zip ties.

Step	Instruction	
25.0	  **CASA System Configuration Overview:**	**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the flight deck doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the aircraft. Excessive output signal level will degrade performance and may interfere with the aircrafts avionics.*** ***Note: Do not perform this test while aircraft is in hangar. The active antenna will not be able to acquire satellites in areas with obstructed view of the sky.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

6.2 C-17 Installation Instructions

Below illustrates the general system installation for C-17 aircraft variants. The GPS Repeater receives GPS signals from AEU/GAS-1. The Repeater re-transmits the GPS signal throughout the cabin area of the aircraft.

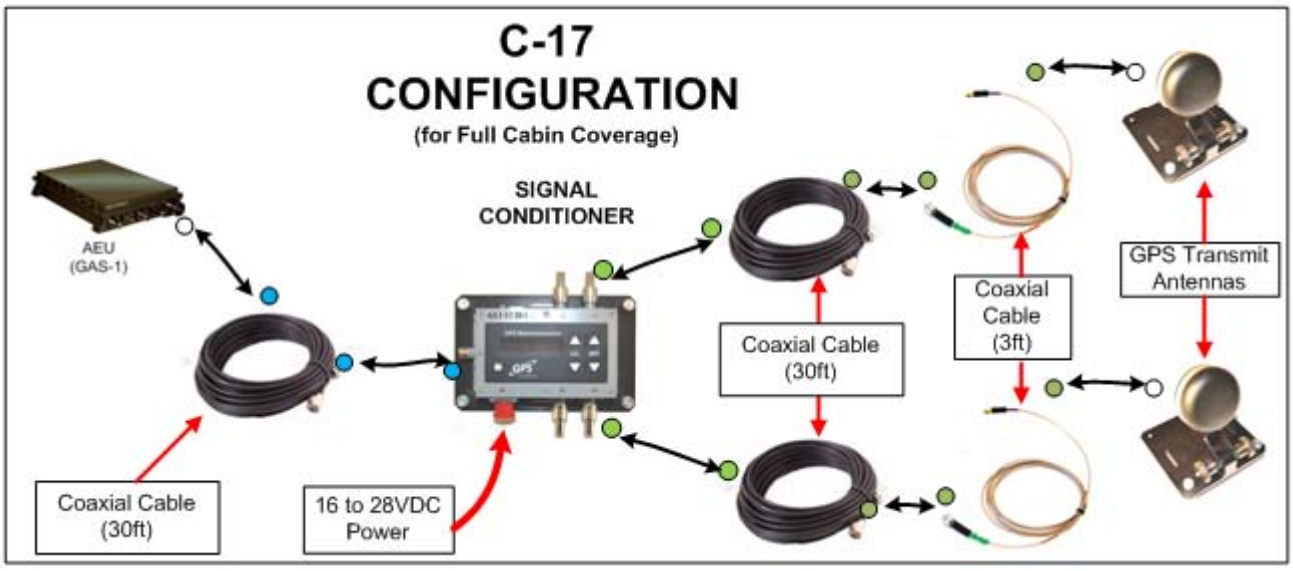


Figure 9: GLI-COBRA C-17 GPS Retransmission System Configuration

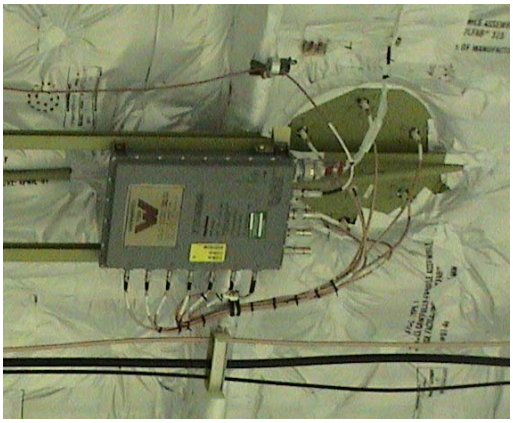
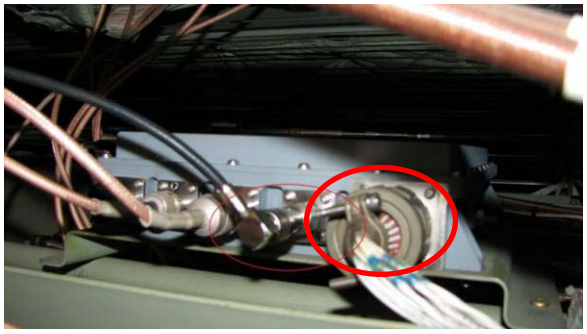
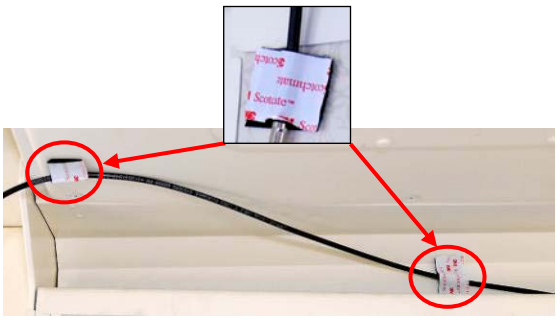
Note: Installation Pictures to be updated upon access to Aircraft

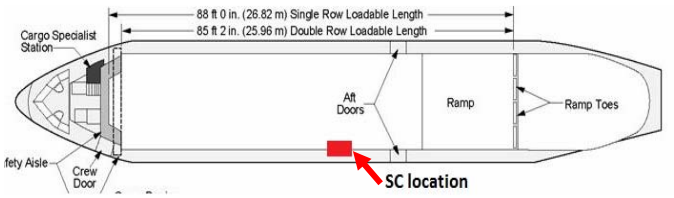
The following sections contain detailed installation instructions for the C-17 aircraft.

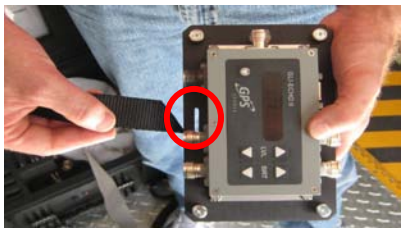
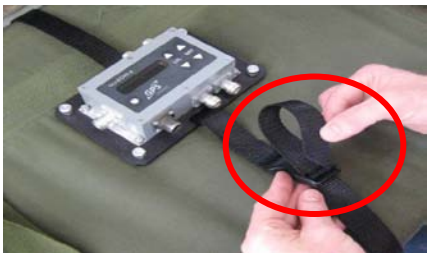
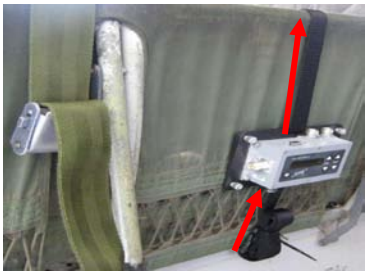
NOTE: System Voltage Requirements

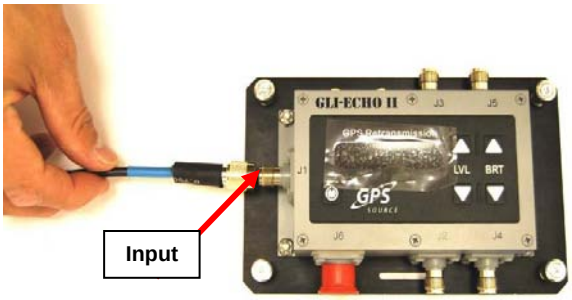
1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28 VDC nominal)

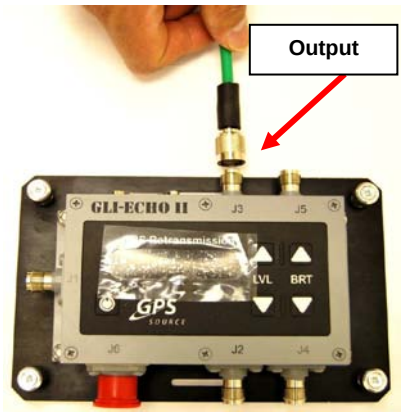
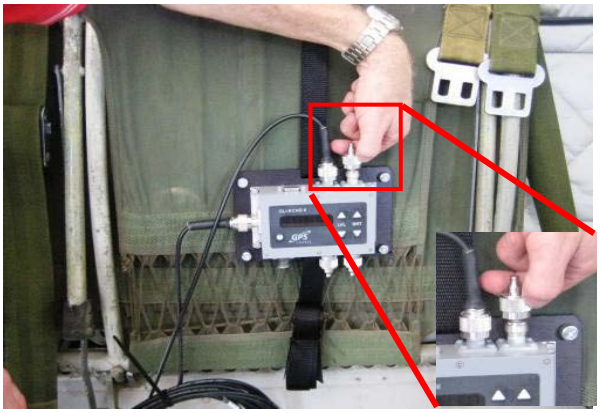
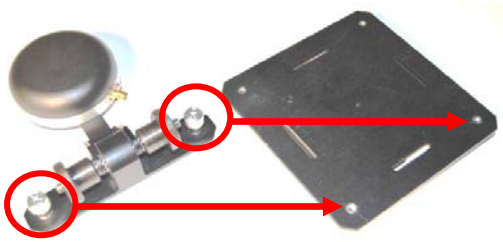
2.) The AEU/GAS-1 GPS output is activated by 5 VDC supplied by the SC

Step	Instruction	
1.0		Locate the AEU or GAS-1 LRU on the aircraft. On the C-17, the AEU/GAS-1 is located high in the top of the cargo compartment, along the centerline of the aircraft, just aft of the wing box (near FS 970). Note: Some C-17 aircraft have been modified to allow for the AEU J4 output available through a pre-installed coax RF cable on the left side of the cargo bay (near FS970).
WARNING: Ensure the SC input Coaxial Cable does not interfere with Aircrew, Aircraft Control Cables, or Exits.		
2.0		**Cable Routing:** Connect the blue TNC(F) end of the 30ft coaxial to the AEU output J4 (Male TNC connector next to large cannon plug wire bundle).
3.0		**Cable Routing:** Route the cable from the AEU/GAS-1 output towards the left side of the aircraft, and then down the inside of the cargo compartment wall toward the ECHO II position. Secure the RF cable with the Velcro strips provided. Ensure the RF cable does not droop or have too much slack. When using the Velcro strips space them every 1 to 2 feet. Use more as necessary.

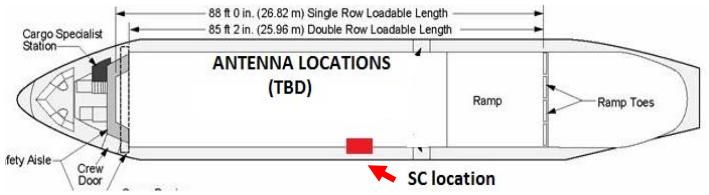
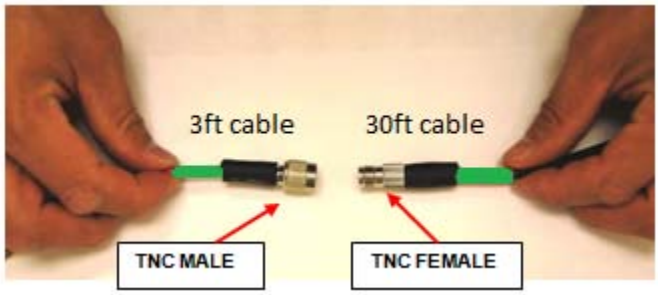
Step	Instruction	
4.0	**Photo to be updated**  	**Signal Conditioner Installation:** Take the nearest jump seat to FS 970 and place it in the upright position. Securely fasten SC with the available hardware. *Ensure that the location chosen will not interfere with crew movement or equipment. The SC should also be located near a 28VDC aircraft power source.*
5.0		**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners.

Step	Instruction	
6.0	 	**Signal Conditioner Installation:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.
7.0	 	**Signal Conditioner Installation:** To attach the SC wrap the loose end of the Nylon strap around the jump seat from the top until it hangs over the back. Ensure the SC is flat against the bottom of the seat and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

Step	Instruction
	WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.
8.0	**Cable Routing:** Route the blue 30ft RF cable (free end) behind the jump seat and up around the front side. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner blue input.
9.0	 	**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF cable to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

Step	Instruction	
10.0	 	**Connect Output Cable:** Unscrew the RF load(s) on the output(s) (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** Connect the green TNC(M) 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). Once more ensure all loads are on the unused outputs.
11.0	 	**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. If the 3ft cable is not already connected to the antenna, then connect the 3ft SMA(m) green cable end to the transmit antenna. (not shown in photo)

Step	Instruction	
12.0		**Install Transmit Antenna Cont'd:** Install the provided loop side velcro patch on the cargo compartment sidewall (location TBD upon access to aircraft).
13.0		**Install Transmit Antenna Cont'd:** Install the transmit antenna with adjustable hinge mount plate by firmly pressing it against the Velcro patch located on the sidewall. For C-17 installations two antennas are required for aft cabin coverage. Repate the above Transmit Antenna installation steps, positioning the second antenna in a location (TBD).
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.		
14.0		**Install Transmit Antenna Cont'd:** Both Transmit Antennas should be facing the rear of the aircraft, and directly down the center of the aircraft. Adjust the transmit antenna position, using the adjustment knobs, start with a 70 degree angle.

Step	Instruction	
	 **Diagram to be updated**	
15.0		**Cable Routing:** Route the 3 ft transmit antenna cable through the airframe towards the 30ft cable end (green) Secure the Transmit antenna cable with zip ties where appropriate. Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cable and 30ft cable with zip ties. Any excess cable should be neatly coiled and secured out of the way.
16.0		**Connect the Power Cable to the Signal Conditioner:** Feed the power cable down through the folded up jump seat, and up around the front side where the SC is located. Secure the excess power cable by coiling up and using zip ties.

Step	Instruction	
17.0		**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the flight deck doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the aircraft. Excessive output signal level will degrade performance and may interfere with the aircrafts avionics.*** ***Note: Do not perform this test while aircraft is in hangar. The active antenna will not be able to acquire satellites in areas with obstructed view of the sky.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

6.3 C-130J Installation Instructions

Below illustrates the general system installation for C-130J aircraft variants. The GPS Repeater receives GPS signals from AEU/GAS-1. The Repeater re-transmits the GPS signal throughout the cabin area of the aircraft.

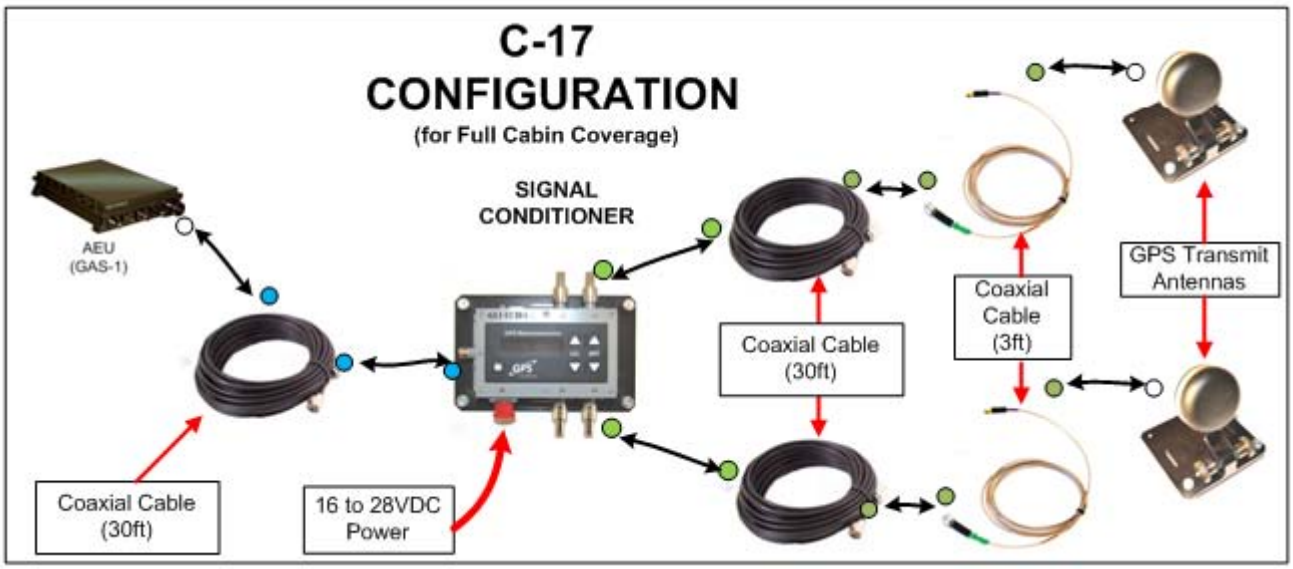


Figure 10: GLI-COBRA C-130J GPS Retransmission System Configuration

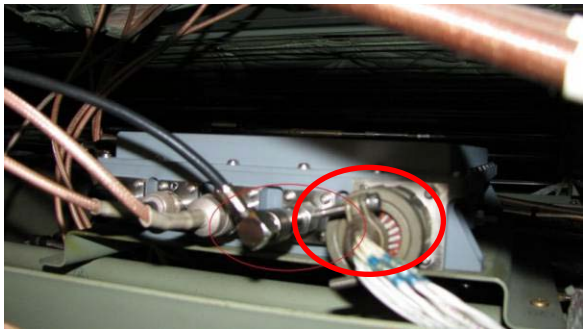
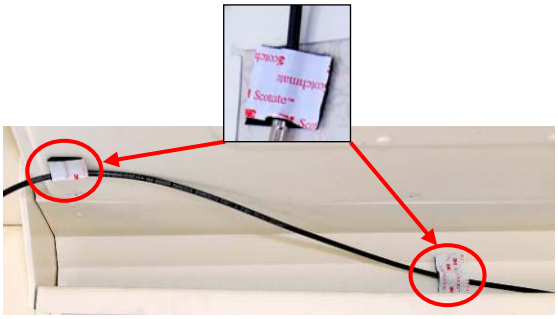
Note: Installation Pictures to be updated upon access to Aircraft

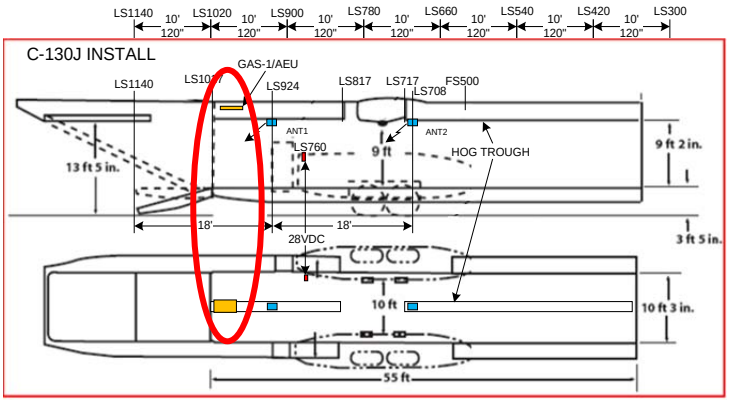
The following sections contain detailed installation instructions for the C-130J aircraft.

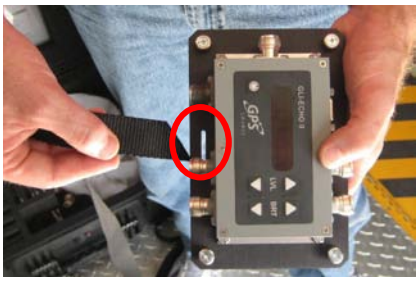
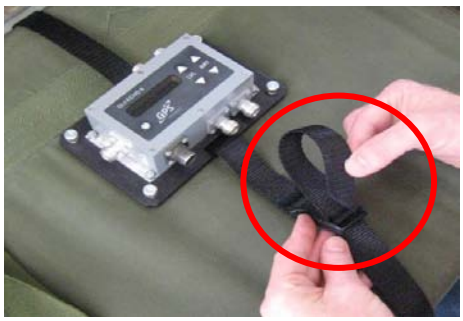
NOTE: System Voltage Requirements

1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28 VDC nominal)

2.) The AEU/GAS-1 GPS output is activated by 5 VDC supplied by the SC

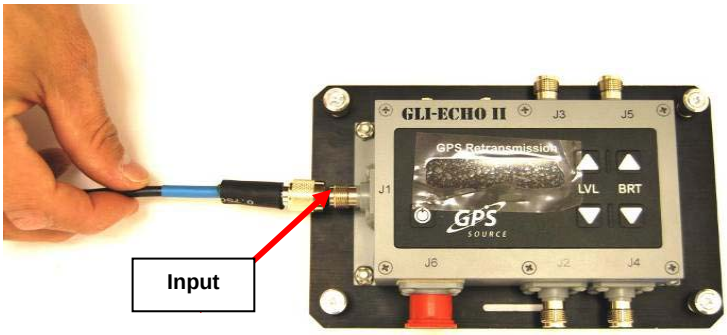
Step	Instruction	
1.0		Locate the AEU or GAS-1 LRU on the aircraft. On the C-130J, the AEU/GAS-1 is sometimes located centerline overhead near the troop doors in the rear of the aircraft.
WARNING: Ensure the SC input Coaxial Cable does not interfere with Aircrew, Aircraft Control Cables, or Exits.		
2.0		**Cable Routing:** Connect the blue TNC(F) end of the 30ft coaxial to the AEU output J4 (Male TNC connector next to large cannon plug wire bundle).
3.0		**Cable Routing:** Route the cable from the AEU/GAS-1 output towards the left side of the aircraft, and then down the inside of the cargo compartment wall toward the ECHO II position. Secure the RF cable with the Velcro strips provided. Ensure the RF cable does not droop or have too much slack. When using the Velcro strips space them every 1 to 2 feet. Use more as necessary.

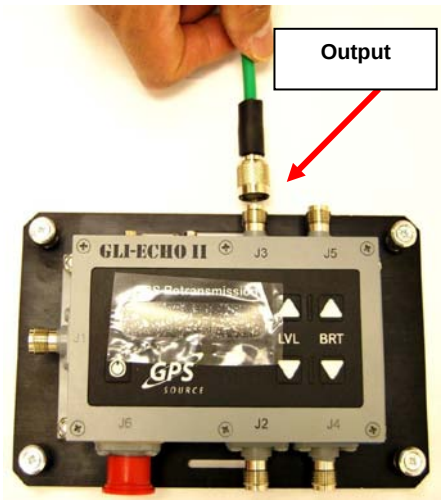
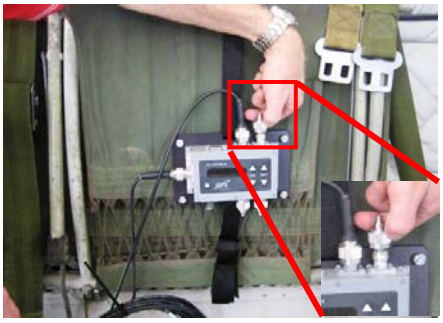
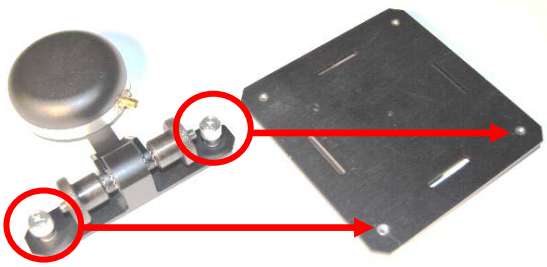
Step	Instruction	
4.0	 **Diagram to be updated**	**Signal Conditioner Installation:** Take the nearest jump seat to the AEU/GAS-1 flight station and place it in the upright position. Securely fasten it with available hardware. *Ensure that the location chosen will not interfere with crew movement or equipment. The SC should also be located near a 28VDC aircraft power source.*
5.0		**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners.

Step	Instruction	
6.0	 	**Signal Conditioner Installation:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.
7.0		**Signal Conditioner Installation:** To attach the SC wrap the loose end of the Nylon strap around the jump seat from the top until it hangs over the back. Ensure the SC is flat against the bottom of the seat and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

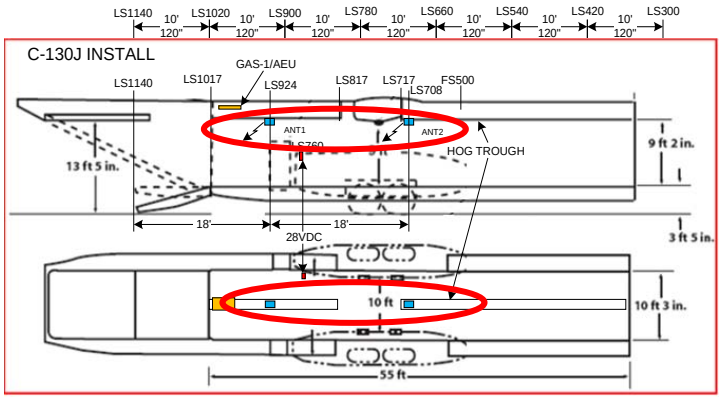
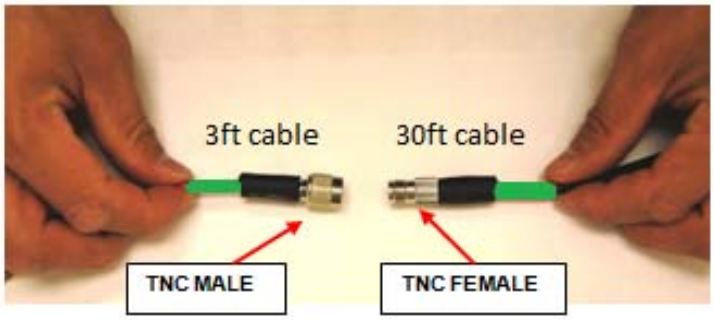
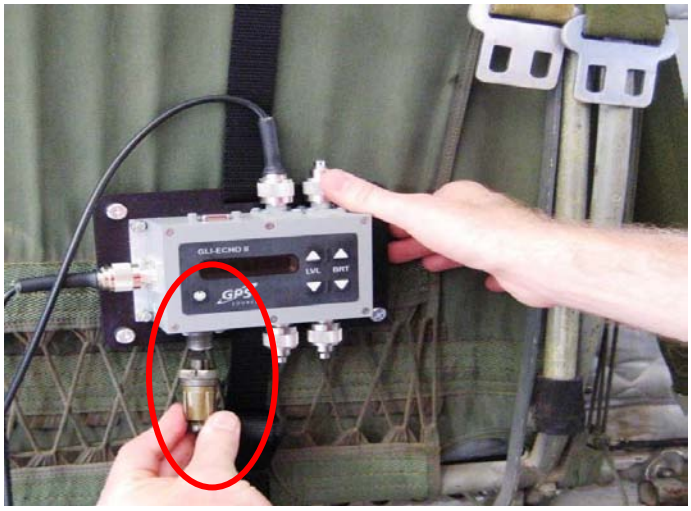
Step	Instruction	

WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

8.0	**Cable Routing:** Route the blue 30ft RF cable (free end) behind the jump seat and up around the front side. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner blue input.	
9.0		**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF cable to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

Step	Instruction	
10.0	 	**Connect Output Cable:** Unscrew the RF load(s) on the output(s) (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** Connect the green TNC(M) 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). Once more ensure all loads are on the unused outputs.
11.0	 	**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. If the 3ft cable is not already connected to the antenna, then connect the 3ft SMA(m) green cable end to the transmit antenna. (not shown in photo)

Step	Instruction	
12.0		**Install Transmit Antenna Cont'd:** Install the provided loop side velcro patch on the cargo compartment sidewall (location TBD upon access to aircraft).
13.0		**Install Transmit Antenna Cont'd:** Install the transmit antenna with adjustable hinge mount plate by firmly pressing it against the Velcro patch located on the sidewall. For C-130 installations two antennas are required for aft cabin coverage. Repeat the above transmit antenna installation steps, positioning the second antenna in a location (TBD). Ensure the excess Nylon strap is neatly wrapped and secured.
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.		
14.0		**Install Transmit Antenna Cont'd:** Both transmit antennas should be facing the rear of the aircraft, and directly down the center of the aircraft. Adjust the transmit antenna position, using the adjustment knobs, start with a 70 degree angle.

Step	Instruction	
	 **Diagram to be updated**	
15.0		**Cable Routing:** Route the 3 ft transmit antenna cable through the airframe towards the green TNC(F) 30ft cable end. Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cable and 30ft cable with zip ties. Any excess cable should be neatly coiled and secured out of the way.
16.0		**Connect the Power Cable to the Signal Conditioner:** Feed the power cable down through the folded up jump seat, and up around the front side where the SC is located. Secure the excess power cable by coiling up and using zip ties.

Step	Instruction	
17.0		**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the flight deck doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the aircraft. Excessive output signal level will degrade performance and may interfere with the aircrafts avionics.*** ***Note: Do not perform this test while aircraft is in hangar.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

6.4 C-130 E/H Installation Instructions

Below illustrates the general system installation for C-130 E/H aircraft variants. The GPS Repeater receives GPS signals from AEU/GAS-1. The Repeater re-transmits the GPS signal throughout the cabin area of the aircraft.

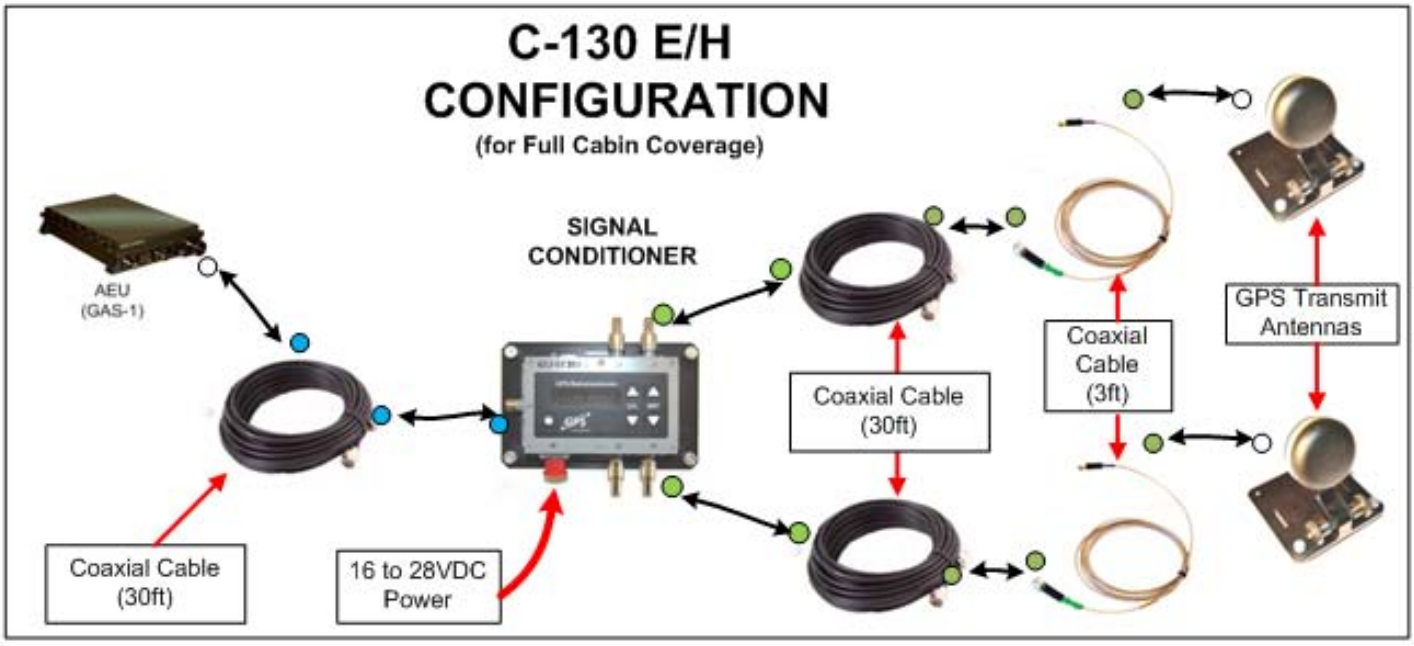


Figure 11: GLI-COBRA C-130 E/H GPS Retransmission System Configuration

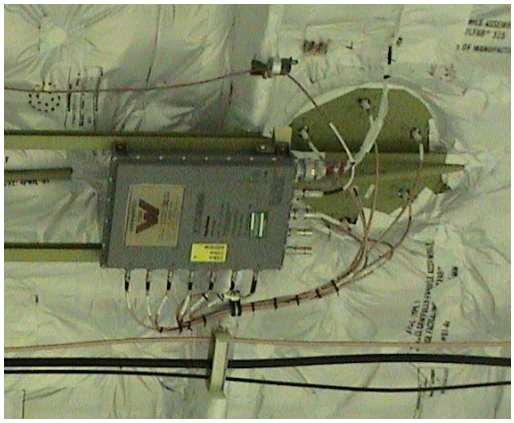
Note: Installation Pictures to be updated upon access to Aircraft

The following sections contain detailed installation instructions for the C-130 E/H aircraft.

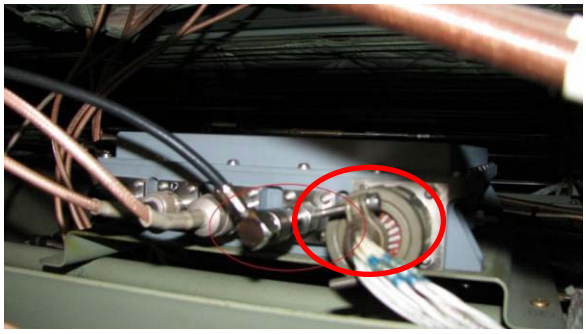
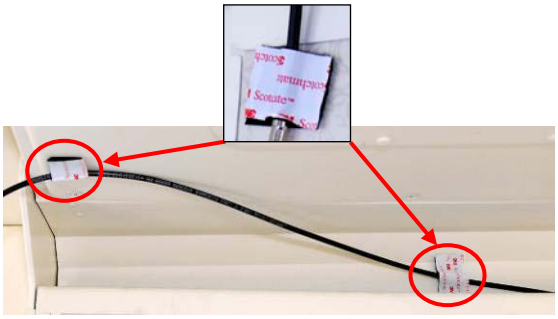
NOTE: System Voltage Requirements

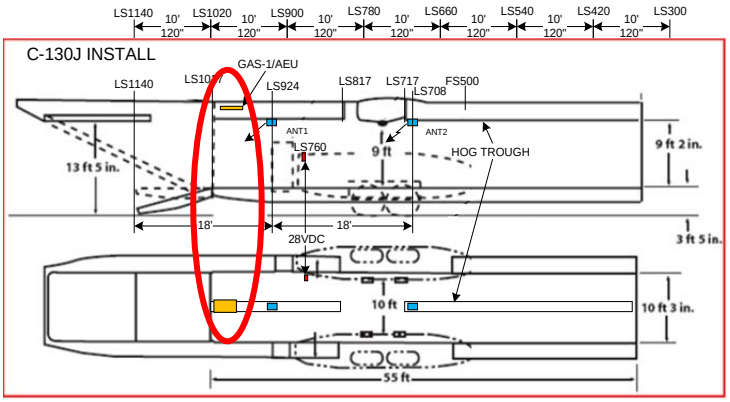
1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28 VDC nominal)

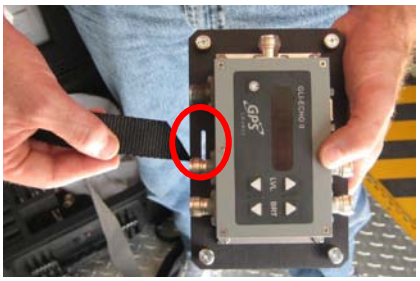
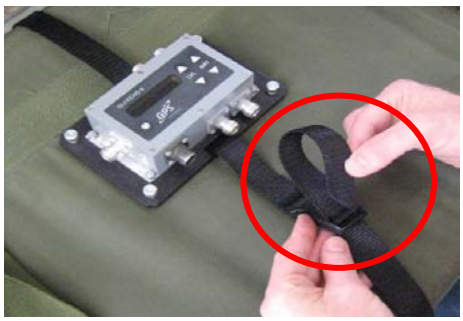
2.) The AEU/GAS-1 GPS output is activated by 5 VDC supplied by the SC

Step	Instruction	
1.0		Locate the AEU or GAS-1 LRU on the aircraft. On the C-130J, the AEU/GAS-1 is sometimes located centerline overhead near the troop doors in the rear of the aircraft.

WARNING: Ensure the SC input Coaxial Cable does not interfere with Aircrew, Aircraft Control Cables, or Exits.

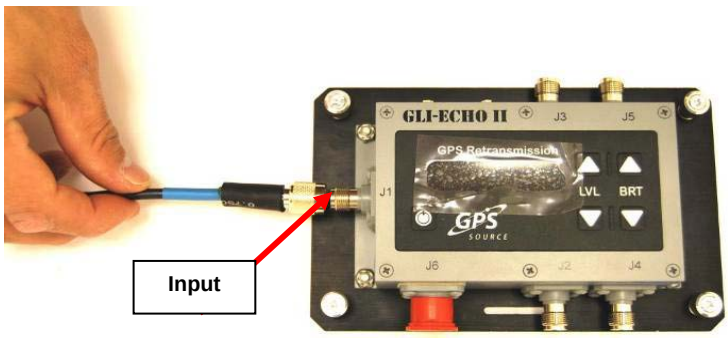
2.0		**Cable Routing:** Connect the blue TNC(F) end of the 30ft coaxial to the AEU output J4 (Male TNC connector next to large cannon plug wire bundle).
3.0		**Cable Routing:** Route the cable from the AEU/GAS-1 output towards the left side of the aircraft, and then down the inside of the cargo compartment wall toward the ECHO II position. Secure the RF cable with the Velcro strips provided. Ensure the RF cable does not droop or have too much slack. When using the Velcro strips space them every 1 to 2 feet. Use more as necessary.

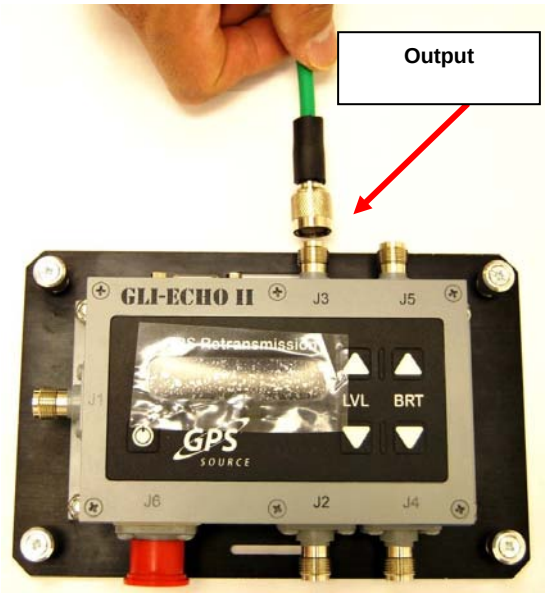
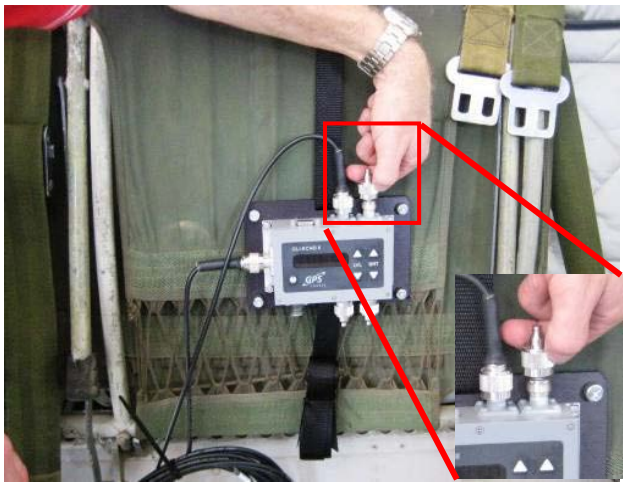
Step	Instruction	
4.0	 **Diagram to be updated**	**Signal Conditioner Installation:** Take the nearest jump seat to the AEU/GAS-1 flight station and place it in the upright position. Securely fasten it with available hardware. *Ensure that the location chosen will not interfere with crew movement or equipment. The SC should also be located near a 28VDC aircraft power source.*
5.0		**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners.

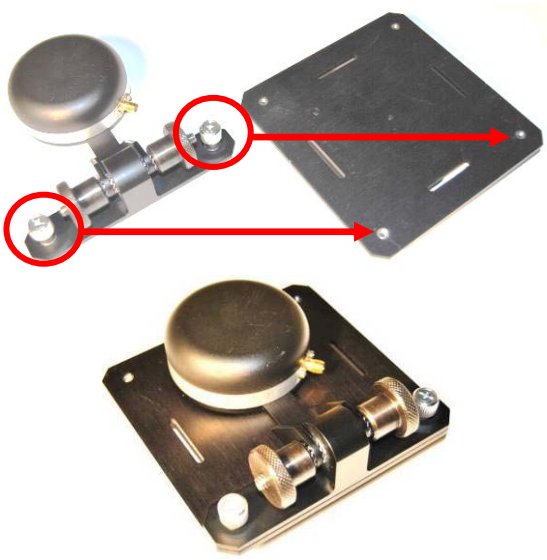
Step	Instruction	
6.0	 	**Signal Conditioner Installation:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.
7.0		**Signal Conditioner Installation:** To attach the SC wrap the loose end of the Nylon strap around the jump seat from the top until it hangs over the back. Ensure the SC is flat against the bottom of the seat and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

Step	Instruction	

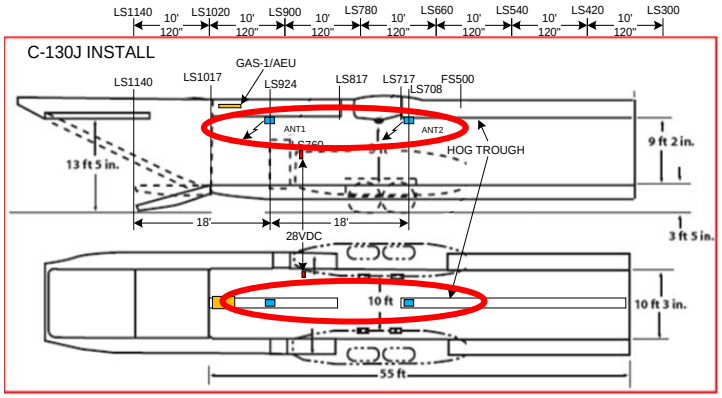
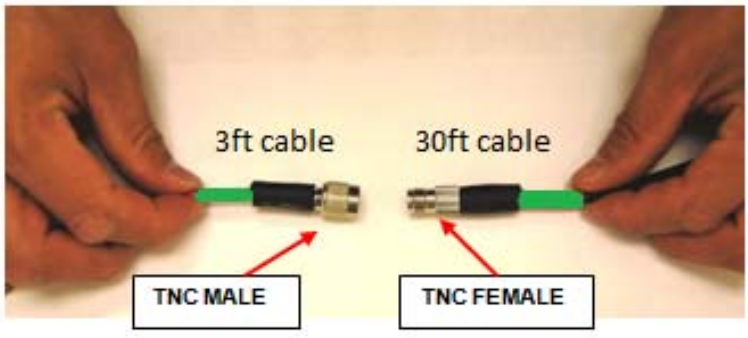
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

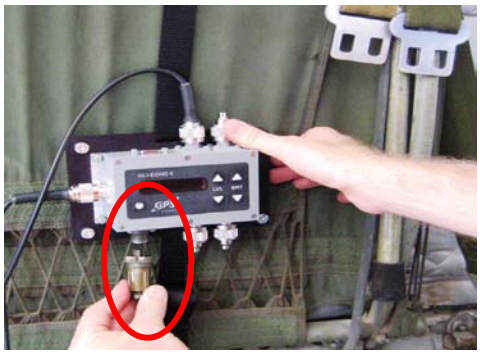
8.0	**Cable Routing:** Route the blue 30ft RF cable (free end) behind the jump seat and up around the front side. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner blue input.	
9.0		**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF cable to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

Step	Instruction	
10.0	 	**Connect Output Cable:** Unscrew the RF load(s) on the output(s) (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** Connect the green TNC(M) 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). Once more ensure all loads are on the unused outputs.

Step	Instruction	
11.0		**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. If the 3ft cable is not already connected to the antenna, then connect the 3ft SMA(m) green cable end to the transmit antenna. (not shown in photo)
12.0		**Install Transmit Antenna Cont'd:** Install the provided loop side velcro patch on the cargo compartment sidewall (location TBD upon access to aircraft).
13.0		**Install Transmit Antenna Cont'd:** Install the transmit antenna with adjustable hinge mount plate by firmly pressing it against the Velcro patch located on the sidewall. For C-130 installations two antennas are required for aft cabin coverage. Repeat the above transmit antenna installation steps, positioning the second antenna in a location (TBD). Ensure the excess Nylon strap is neatly wrapped and secured.

WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

Step	Instruction	
14.0	  **Diagram to be updated**	**Install Transmit Antenna Cont'd:** Both transmit antennas should be facing the rear of the aircraft, and directly down the center of the aircraft. Adjust the transmit antenna position, using the adjustment knobs, start with a 70 degree angle.
15.0	 	**Cable Routing:** Route the 3 ft transmit antenna cable through the airframe towards the green TNC(F) 30ft cable end. Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cable and 30ft cable with zip ties. Any excess cable should be neatly coiled and secured out of the way.

Step	Instruction	
16.0		**Connect the Power Cable to the Signal Conditioner:** Feed the power cable down through the folded up jump seat, and up around the front side where the SC is located. Secure the excess power cable by coiling up and using zip ties.
17.0		**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the flight deck doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the aircraft. Excessive output signal level will degrade performance and may interfere with the aircrafts avionics.*** ***Note: Do not perform this test while aircraft is in hangar.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

6.5 C-27J Installation Instructions

Below illustrates the general system installation for C-27 aircraft variants. The GPS Repeater receives GPS signals from AEU/GAS-1. The Repeater re-transmits the GPS signal throughout the cabin area of the aircraft.

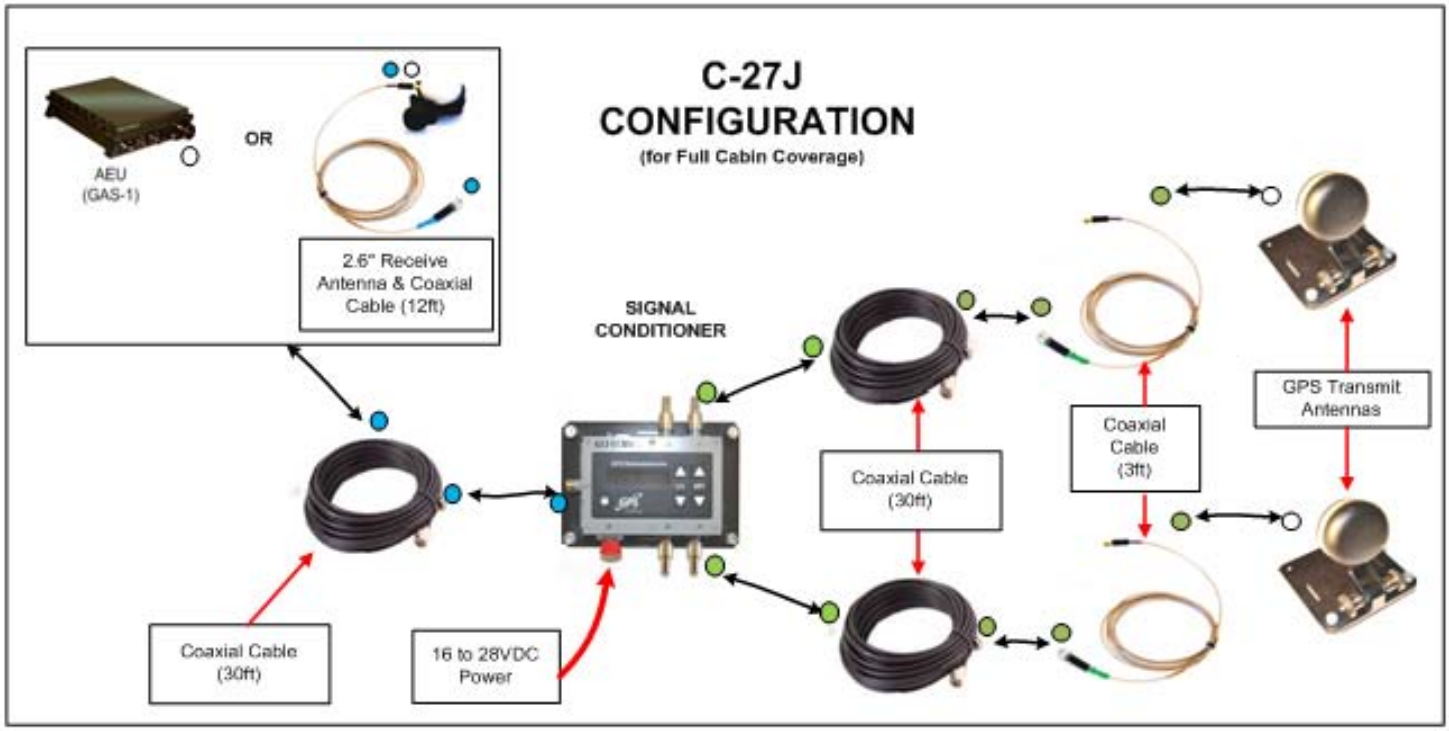


Figure 12: GLI-COBRA C-27J GPS Retransmission System Configuration

Note: Installation Pictures to be updated upon access to Aircraft

The following sections contain detailed installation instructions for the C-27J aircraft.

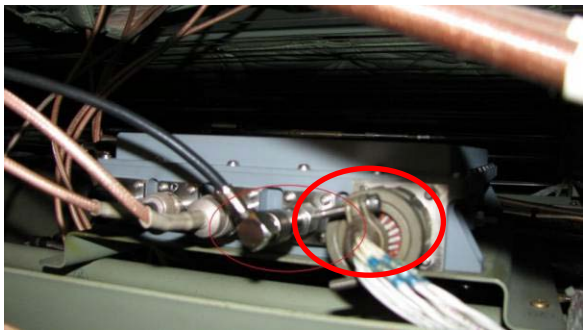
NOTE: System Voltage Requirements

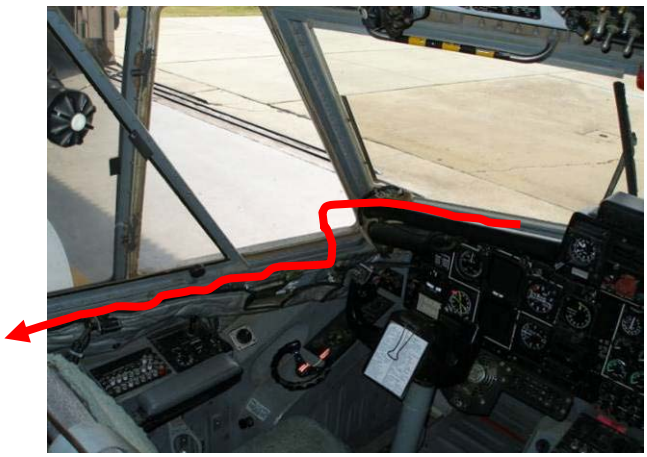
1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28 VDC nominal)

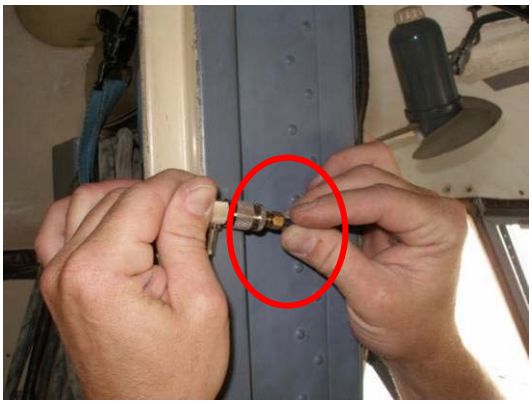
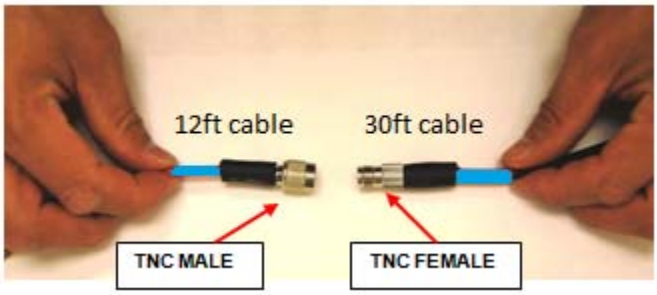
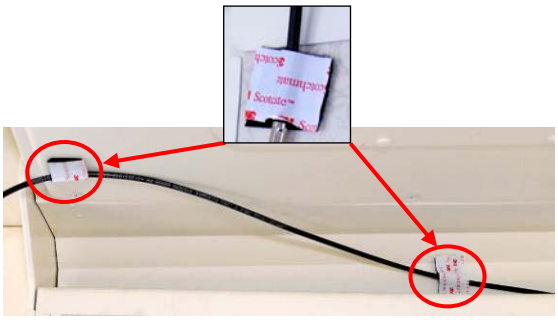
2.) The AEU/GAS-1 GPS output is activated by 5 VDC supplied by the SC

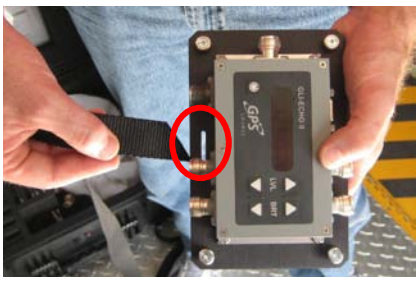
Step	Instruction	
1.0	 **OR** 	**Acquiring Live Signal:** Locate the AEU or GAS-1 LRU on the aircraft. **OR** Prepare the 2.6” Antenna on suction cup hinge for installation on dash. Adjust the Antenna hinge mount thumb knob counterclockwise until both plates are loose. Position the suction cup plate, and Antenna plate so that they create an up-side-down “V”. Re-tighten the thumb knob clockwise to lock in place. If not already connected, then connect the blue SMA(M) 12ft cable to the active antenna. Skip to step 3.

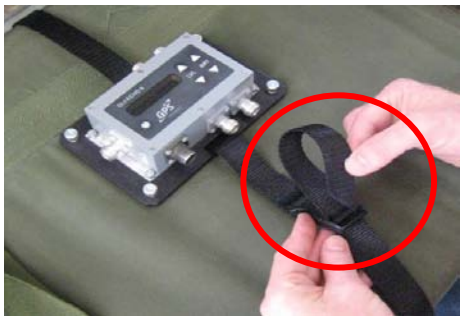
WARNING: Ensure the SC input Coaxial Cable does not interfere with Aircrew, Aircraft Control Cables, or Exits.

2.0		**Cable Routing:** Connect the blue TNC(F) end of the 30ft coaxial to the AEU output J4 (Male TNC connector next to large cannon plug wire bundle). Skip to Step 7.

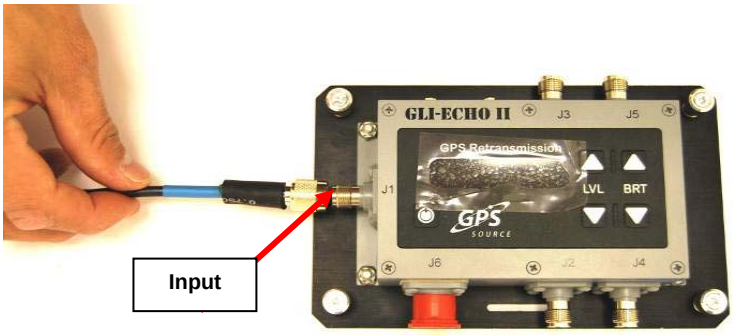
3.0		Moisten suction cups prior to installation. Position the Antenna hinge mount on the left windscreen at the lowest point just above and to the left of the dashboard. Press suction cup plate firmly against windscreen. Ensure the Antenna is pointing upward.
4.0		Loosen the thumb knob and adjust the angle of the Antenna. The Antenna should be oriented upwards, and nearly parallel to the windscreen. This ensures the Antenna views as much of the sky as possible. Re-tighten the thumb knob until the Antenna plate is secure.
5.0		**Cable Routing:** Route the cable in between the Antenna hinge mount and along the dashboard to the left. Continue cable routing along left side window and behind the pilot's seat, and along the crew bulkhead. Use cable ties and velcro strips as needed. The connector with the blue TNC(F) end of the 12ft cable should be routed towards the rear of the aircraft.

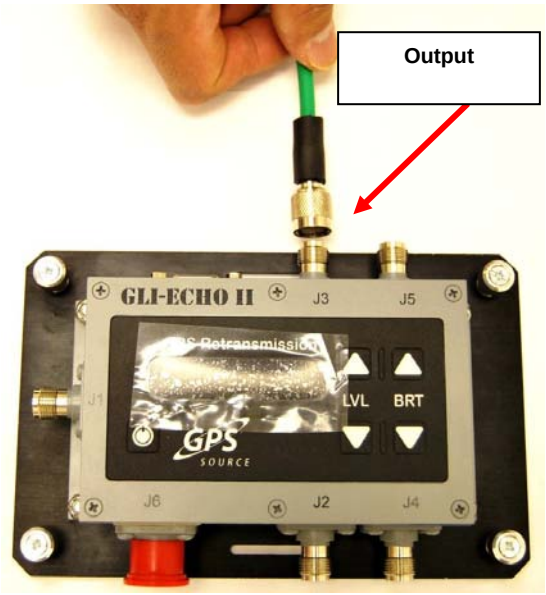
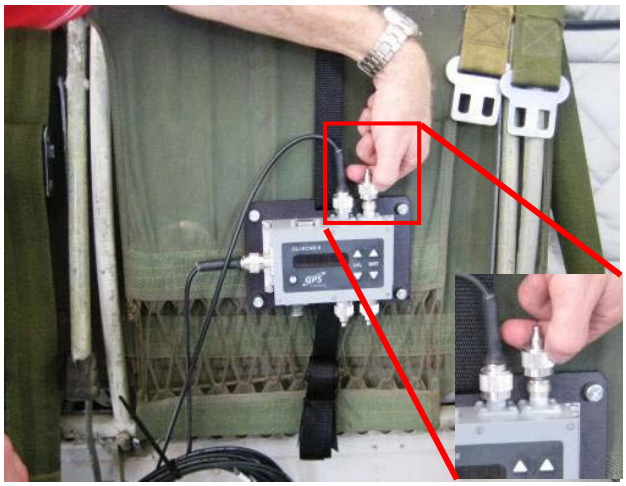
6.0	 	**Cable Routing:** Continue routing the Antenna cable through the crew doorway and along the backside of the crew bulkhead. Secure the cable with the cable ties or velcro strips. Once the Antenna cable has reached its maximum length, connect it to the 30ft black RF cable. Connect the blue TNC(M) end of the 12ft Antenna cable with the blue TNC(F) end of the 30ft RF cable as shown. Note: The connector on the 12ft Antenna cable end will be TNC (M), and the connector on the 30ft RF cable end will be TNC (F).
7.0		**Cable Routing:** Route the blue TNC(M) end of the 30 ft RF cable towards the left side of the aircraft, and then down the inside of the cargo compartment wall to the SC position. Secure the 30 ft RF cable with the velcro strips or zip ties provided. Ensure the RF cable does not droop or have too much slack. When using the velcro strips or zip ties space them every 1 to 2 feet. Use more as necessary.
8.0	**Signal Conditioner Installation:** Take the nearest jump seat and place it in the upright position. Securely fasten it with available hardware. *Ensure that the location chosen will not interfere with crew movement or equipment. The SC should also be located near a 28VDC aircraft power source.*	

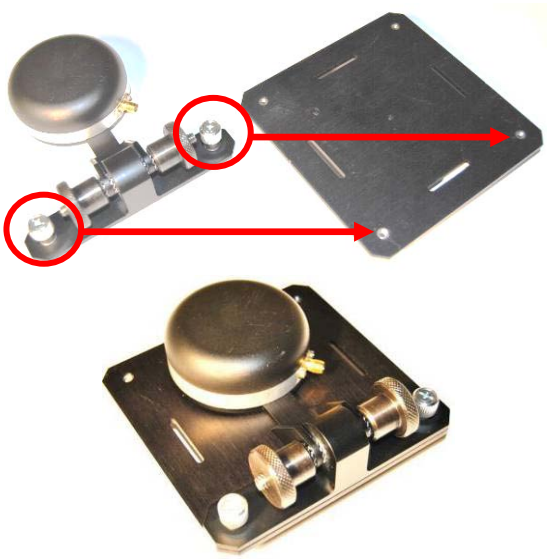
Step	Instruction	
9.0		**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners.
10.0		**Signal Conditioner Installation:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.

Step	Instruction	
11.0	 	**Signal Conditioner Installation:** To attach the SC wrap the loose end of the Nylon strap around the jump seat from the top until it hangs over the back. Ensure the SC is flat against the bottom of the seat and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

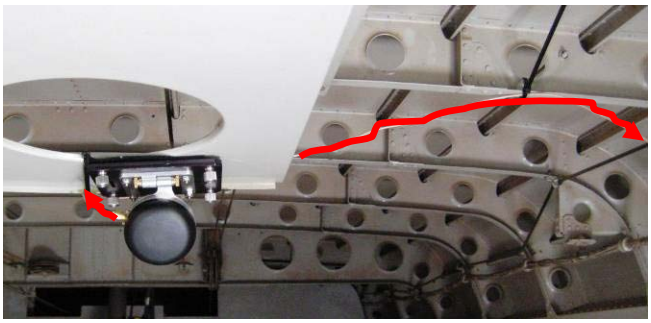
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

12.0	**Cable Routing:** Route the free end (blue) of the 30ft RF cable behind the jump seat and up around the front side. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner.	
13.0		**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF cable to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

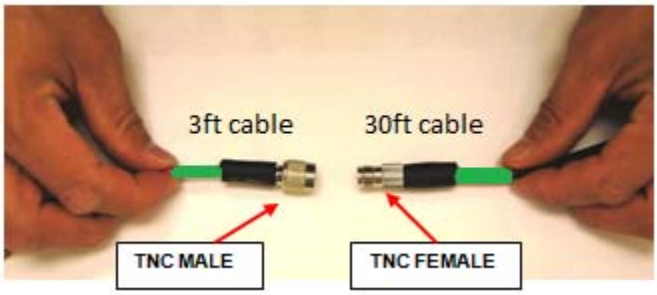
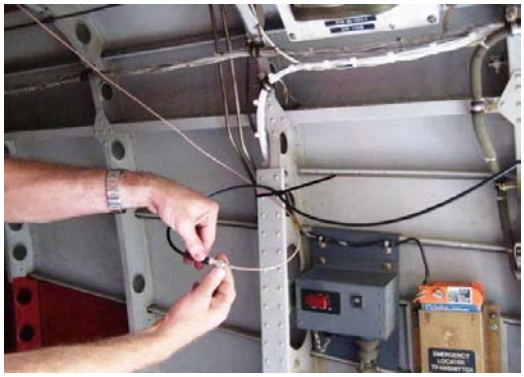
Step	Instruction	
14.0	 	**Connect Output Cable:** Unscrew the RF load(s) on the output(s) (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** Connect the green TNC(M) of the 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). Repeat for the other 30ftRF cable. Once more ensure all loads are connected on the unused outputs of the SC.

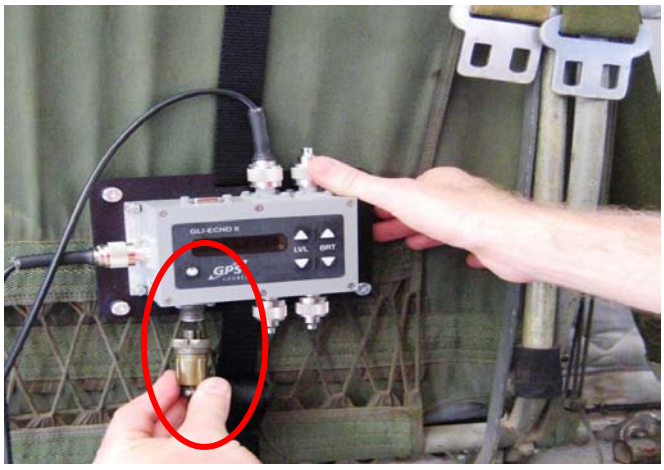
Step	Instruction	
15.0		**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. If the 3ft cable is not already connected to the antenna, then connect the 3ft SMA(m) green cable end to the transmit antenna. (not shown in photo)
16.0		**Install Transmit Antenna Cont'd:** Install the provided loop side velcro patch on the cargo compartment sidewall (location TBD upon access to aircraft).
17.0		**Install Transmit Antenna Cont'd:** Install the transmit antenna with adjustable hinge by firmly pressing it against the velcro patch located on the ceiling.

WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

Step	Instruction	
18.0		**Install Transmit Antenna Cont'd:** Adjust the transmit antenna position, using the adjustment knobs, start with a 70 degree angle and adjust to improve performance as needed. Both Transmit Antennas should be facing the direction that GPS is needed, and directly down the center of the aircraft. Once positioned, ensure the knobs are securely tightened, or the position of antenna may change, and degrade system performance.
19.0	 	**Cable Routing:** Route the Transmit antenna cables through the airframe. Secure the Transmit antenna cables with zip ties where appropriate.

WARNING: Do not secure antenna cable to aircraft linkages or mechanical pulley cables!

Step	Instruction	
20.0	 	**Cable Routing:** Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cables and 30ft cables with zip ties. Any excess cable should be neatly coiled and secured out of the way.
21.0	 	**Install BA5590 Battery:** Connect the BA5590 Battery cable to the BA5590 battery. Secure the power cable to the Battery using the large velcro strap that has the buckle. The power cable should be placed between the pieces of interlocking Velcro.

Step	Instruction	
22.0	**Cable Routing-Power:** Place the BA5590 Battery, with the power cable attached, behind the jump seat where the SC is located. Placing the battery here will help in preventing damage to the aircraft, and interference with crew movement.	
23.0		**Connect the Power Cable to the Signal Conditioner:** Feed the power cable down through the folded up jump seat, and up around the front side where the SC is located. Secure the excess power cable by coiling up and using zip ties.

Step	Instruction	
24.0		**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the flight deck doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the aircraft. Excessive output signal level will degrade performance and may interfere with the aircrafts avionics.*** ***Note: Do not perform this test while aircraft is in hangar. The active antenna will not be able to acquire satellites in areas with obstructed view of the sky.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

6.6 Ground Vehicle Installation Instructions

Below illustrates the general system installation for ground vehicles. The GPS Repeater receives GPS signals from the dash or windscreen mounted 2.6" L1 Active Antenna. The Repeater re-transmits the GPS signal throughout the cabin area of the ground vehicle.

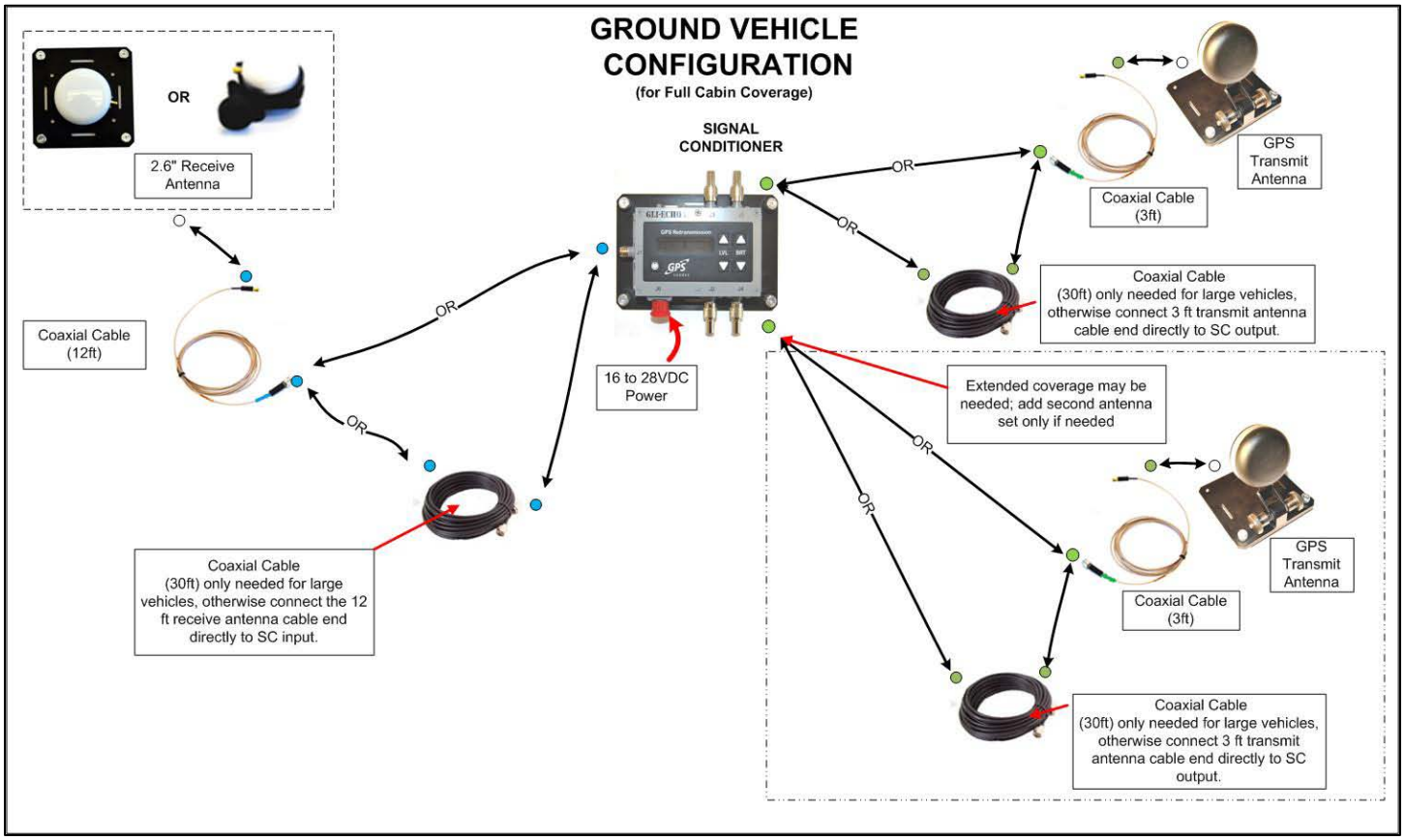

GROUND VEHICLE CONFIGURATION
(for Full Cabin Coverage)
SIGNAL CONDITIONER
OR
2.6" Receive Antenna
Coaxial Cable (12ft)
Coaxial Cable (30ft) only needed for large vehicles, otherwise connect the 12 ft receive antenna cable end directly to SC input.
16 to 28VDC Power
GPS Transmit Antenna
Coaxial Cable (3ft)
Coaxial Cable (30ft) only needed for large vehicles, otherwise connect 3 ft transmit antenna cable end directly to SC output.
Extended coverage may be needed; add second antenna set only if needed
GPS Transmit Antenna
Coaxial Cable (3ft)
Coaxial Cable (30ft) only needed for large vehicles, otherwise connect 3 ft transmit antenna cable end directly to SC output.

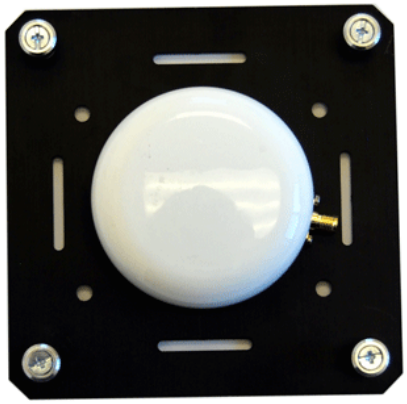
Figure 13: GLI-COBRA Ground Vehicle GPS Retransmission System Configuration

The following sections contain detailed installation instructions for the Ground Vehicle Installation.

NOTE: System Voltage Requirements

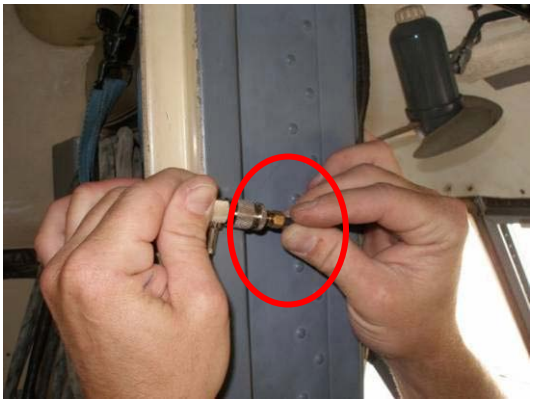
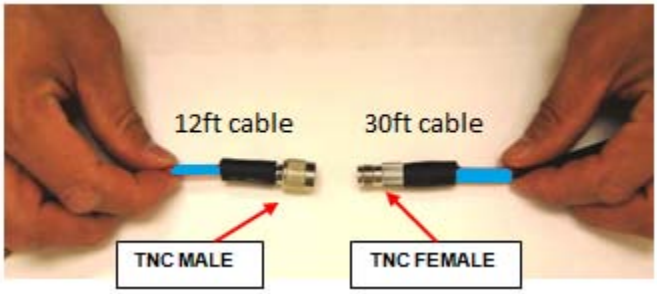
1.) The Signal Conditioner (SC) LRU operates from 16 to 32 VDC (28VDC nominal)

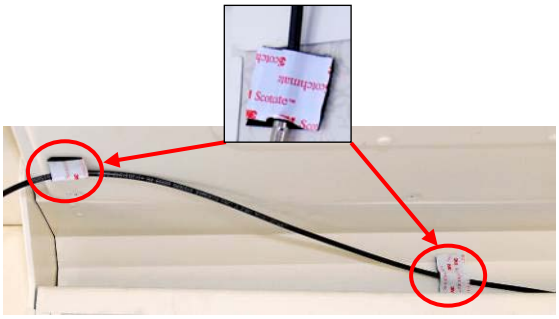
2.) The 2.6" L1/L2 Active Antenna operates on 5 VDC supplied by the SC

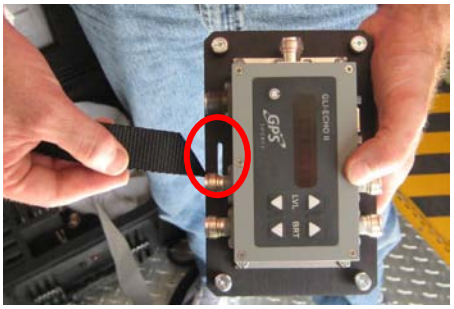
Step	Instruction	
1.0	**Active Antenna on Suction Cups** **OR** **Active Antenna on Magnetic Plate** 	**Installing Active Antenna:** Prepare the 2.6” Antenna on suction cup hinge for installation on dash. Adjust the Antenna hinge mount thumb knob counterclockwise until both plates are loose. Position the suction cup plate, and Antenna plate so that they create an up-side-down “V”. Re-tighten the thumb knob clockwise to lock in place. Connect the blue SMA(M) 12 ft cable to the active antenna if not already connected. **OR** Use the active antenna on magnetic plate and mount the antenna on the exterior of the vehicle. Fasten the active antenna using the four fasteners to the magnetic plate. Do not mount the magnet near a window or open access hatch to avoid signal deflection. Ensure the active antenna has a clear view of the sky. Connect the blue SMA(M) 12 ft cable to the active antenna if not already connected. If using active antenna on magnetic mount then skip to Step 5.

WARNING: Ensure the chosen location for the 2.6” Antenna hinge mount and cable will not impede crew visibility or controls, and exits.

2.0		**Active Antenna using suction cups:** Moisten suction cups prior to installation. Position the Antenna hinge mount on the left windscreen at the lowest point just above and to the left of the dashboard. Press suction cup plate firmly against windscreen. Ensure the Antenna is pointing upward.

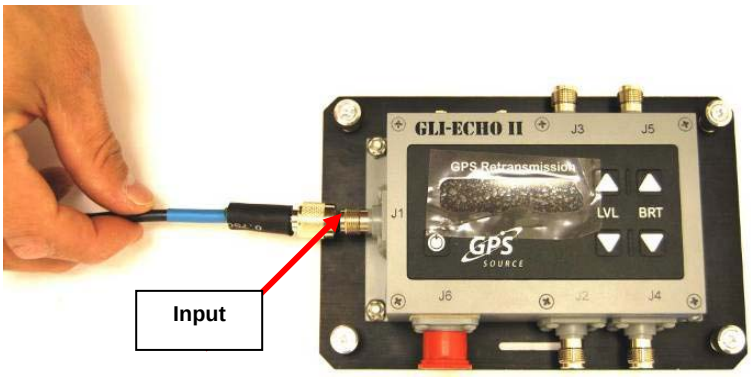
3.0		**Active Antenna using suction cups:** Loosen the thumb knob and adjust the angle of the Antenna. The Antenna should be oriented upwards, and nearly parallel to the windscreen. This ensures the Antenna views as much of the sky as possible. Re-tighten the thumb knob until the Antenna plate is secure.
4.0	**Cable Routing:** Route the cable in between the Antenna hinge mount and along the dashboard to the left. Continue cable routing up above the window and behind the driver's seat. Use cable ties and Velcro strips as needed. The connector with the blue TNC(F) end should be towards the rear of the aircraft.	
5.0	 	**Cable Routing:** Continue routing the Antenna cable through the crew doorway and along the backside of the crew bulkhead. Secure the cable with the cable ties or Velcro strips. Once the Antenna cable has reached its maximum length, connect it to the 30ft black RF cable. Connect the blue TNC(M) end of the 12ft Antenna cable with the blue TNC(F) end of the 30ft RF cable as shown. Note: The connector on the 12ft Antenna cable end will be TNC (M), and the connector on the 30ft RF cable end will be TNC (F).

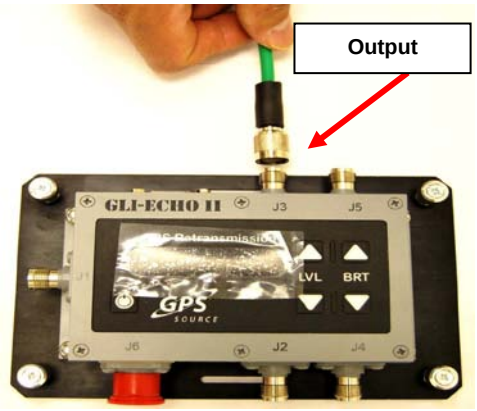
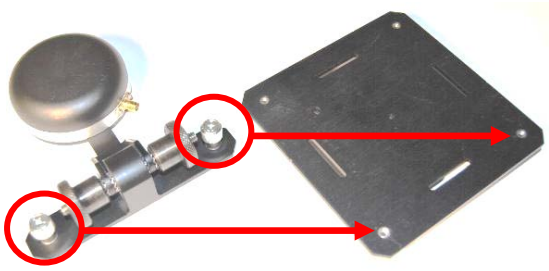
Step	Instruction	
6.0		**If Using 30' Cable Routing:** Skip this step if not using the 30' black RF cable. Route the 30ft black RF cable along the back side of the crew bulkhead towards the left side of the plane. Continue routing the RF cable above front crew exit door and towards the rear of the cargo compartment. Secure the RF cable with the Velcro strips provided. Ensure the RF cable does not block the exit door or the cable does not get pinched. When using the Velcro strips space them every 1 to 2 feet. Use more as necessary.
7.0	**Cable Routing:** Continue routing the RF cable rearward along the left upper side of the crew compartment. Secure the RF cable with the provided cable ties or Velcro strips.	
8.0	**Cable Routing:** Route the RF cable to the SC input side. Proper installation of the RF cable will leave a small amount of slack for attaching the RF cable connector to the Signal conditioner.	
9.0		**Signal Conditioner Installation:** Attach the SC mounting plate to the foam cushion adapter plate using the four fasteners if strapping the unit to a seat. Continue to next step. **OR** Attach the SC mounting plate to the magnetic adapter plate using the four fasteners. If using the magnetic mounting plate then skip to step 12. **OR** Attach the SC mounting plate to the velcro adapter plate using the four fasteners. Continue to next step.

Step	Instruction	
	 Shown is the foam plate, this may be magnetic or velcro depending on application.	
10.0		**Signal Conditioner Installation using Nylon Strap:** Take the free end of the Nylon strap and place it through the top side of the mounting plate slot. Pull the Nylon strap about ¾ of its length then push the free end up through the mounting plate slot. Pull the free end until the excess is removed and the SC is approximately 8 inches from the adjustable buckle.

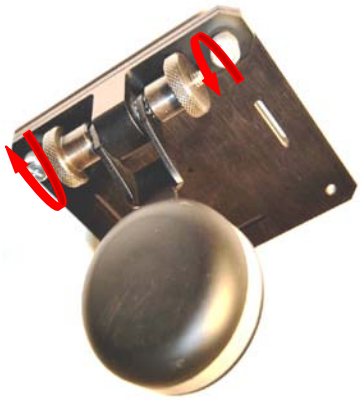
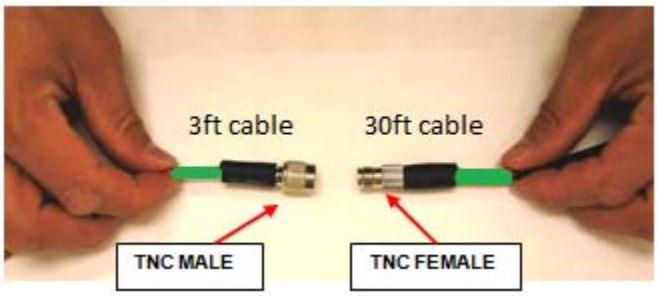
Step	Instruction	
11.0		**Signal Conditioner Installation using Nylon Strap:** To attach the SC wrap the loose end of the Nylon strap around a secure structure from the top until it hangs over the back. Ensure the SC is flat against the bottom of the secure structure and the Nylon buckle is pointing downwards. Secure the SC using the synch buckle. Ensure the excess Nylon strap is neatly wrapped and secured.

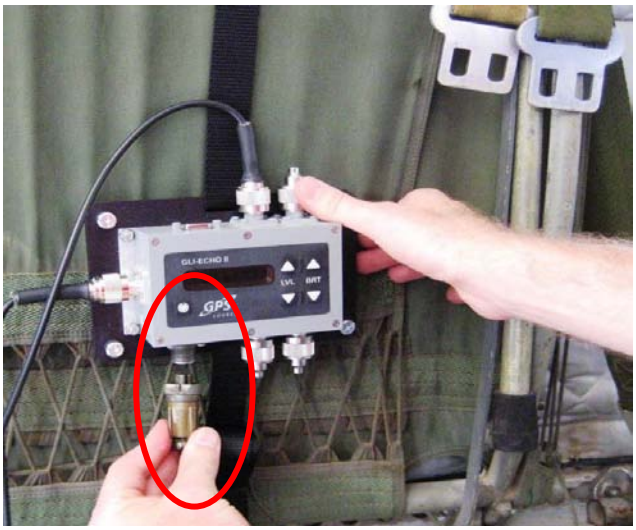
WARNING: Ensure the SC input Coaxial and Power Cables do not interfere with Aircrew, Aircraft Control Cables, or Exits.

12.0		**Connect Input Cable:** Connect the blue TNC(M) connector end of the 30ft RF (or the 12ft cable if not using the 30ft cable) to the blue SC input connector and securely tighten. The blue marker cable end should match the blue marker on the SC input connector (J1). Any excess cable should be neatly wound and secured with zip ties to prevent damage to system or crew movement.

Step	Instruction	
13.0		**Connect Output Cable:** Unscrew the RF load(s) on the output (J2, J3, J4 or J5) that will be used. **All unused outputs must have the loads attached or the SC will indicate faults when the unit is powered on.** *If using the green 30ft RF Cable:* Connect the green TNC(M) 30ft RF cable to the green SC output connector with the removed load (J2, J3, J4 or J5). **OR** *If using the only the 3ft RF Cable:* Connect the green TNC(M) transmit antenna cable to the green SC output connector with the removed load (J2, J3, J4 or J5). ***NOTE:*** Ensure all loads are on the unused outputs.
14.0	**Cable Routing:** Route the output green RF cable above the crew compartment with the other end of the cable being approximately the location of where GPS is needed. Secure the RF cable using zip ties and Velcro strips.	
15.0		**Install Transmit Antenna:** Attach the transmit antenna hinge mount, and velcro mounting plate using the knob fasteners. The velcro patch should be facing opposite the antenna. **OR** Mount the antenna hinge mount using the universal magnetic mount. Place the mount in a location where the magnets will not slide. Skip to step 18.

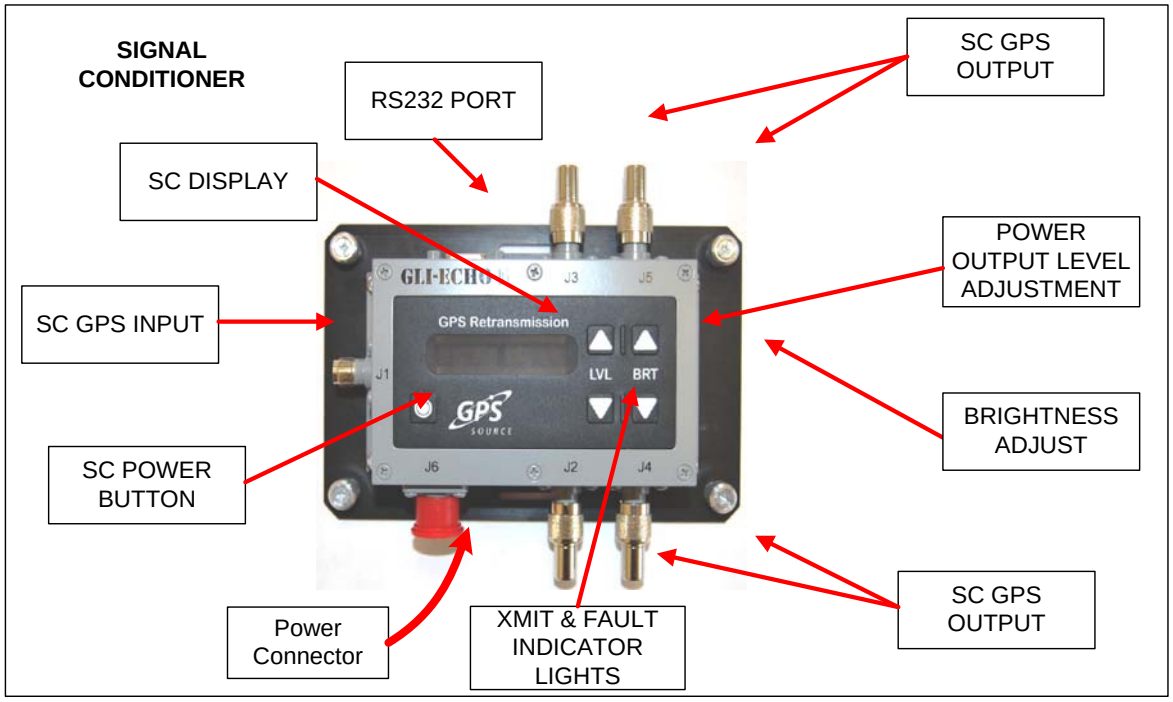
Step	Instruction	
16.0	 	**Install Transmit Antenna using Velcro:** Install the provided fuzzy side velcro patch on the crew compartment ceiling.
17.0		**Install Transmit Antenna using Velcro:** Install the transmit antenna with adjustable hinge by firmly pressing it against the velcro patch located on the ceiling.

Step	Instruction	
18.0		**Install Transmit Antenna:** Adjust the transmit antenna position, using the adjustment knobs. Start with an angle that is approximately 70 degrees and adjust to improve performance. Once positioned ensure the knobs are securely tightened, or the position of antenna may change, and degrade system performance.
19.0		**Cable Routing:** Secure the 3 ft transmit antenna cable with zip ties where appropriate. Attach the SMA(M) green end of the 3 ft cable to the antenna if not already connected.
WARNING: Do not secure antenna cable to mechanical linkages or mechanical pulley cables!		
20.0		**If using output 30' Cable:** Connect the green TNC(M) of the 3ft transmit antenna cable to the green TNC(F) of the 30ft RF cable. Secure the transmit antenna cable and 30ft cable with zip ties. Any excess cable should be neatly coiled and secured out of the way.

Step	Instruction	
21.0	 	**Install BA5590 Battery:** Connect the BA5590 Battery cable to the BA5590 battery. Secure the power cable to the Battery using the large velcro strap that has the buckle. The power cable should be placed between the pieces of interlocking Velcro.
22.0	**Cable Routing-Power:** Secure the BA5590 Battery.	
23.0		**Connect the Power Cable to the Signal Conditioner:** Connect the power cable to the SC. Secure the excess power cable by coiling up and using zip ties.

Step	Instruction	
24.0		**Power on Signal Conditioner:** Verify SC operation by powering on system. Hold down the power button for 2 seconds until unit powers up. Press the **"LVL"** down button until the display reads LVL 3. Using a handheld GPS device stand at the doorway and verify the number of satellites being detected. Adjust the LVL up/down until all satellites are being detected. ***Note: Adjust the "LVL" setting as low as possible in order to achieve the desired signal coverage in the vehicle. Excessive output signal level will degrade performance.*** ***Note: Do not perform this test while vehicle is in the hangar. The active antenna will not be able to acquire satellites in areas with obstructed view of the sky.*** Set the brightness level **"BRT"** up or down depending on the mission at hand. ***Note: Setting the system BRT level to "0" will turn off the SC's display lights making the system compatible for applications utilizing Night Vision Goggles.*** If the "Fault" light indicator becomes lit, or the system does not power on refer to the Fault isolation guide for troubleshooting. Perform the 'System Checkout' in Section 8.0.

7.0 ECHO II System Operation:



Complete installation of the ECHO II Signal Conditioner according to the installation instructions in the previous sections prior to operation of the ECHO II.

1. **Enable ECHO II Power**: To enable the ECHO II Signal Conditioner, press and hold the power button on the face of the ECHO II for 2 seconds until the display turns on. Once the power is on, the system will begin transmitting the GPS signals within 10 seconds if the system is fully operational. Although the System will begin transmitting the within 10 seconds, the system may require as much as 4 minutes to become fully initialized.

2. **Disable ECHO II Power:** To disable the ECHO II hold the Power button for 3 or more seconds.

3. **DISPLAY**: The **DISPLAY** indicates the power level/brightness level of the ECHO II. The **DISPLAY** will also indicate any faults detected by the ECHO II and the fault code.

4. **XMIT LED**: The **XMIT** LED indicates the transmit status of the ECHO II. If **XMIT** is illuminated or flashing, the ECHO II is transmitting the GPS signals through all operational GPS Retransmission Antennas. If **XMIT** is flashing, the ECHO II is acquiring satellites.

5. **FAULT LED**: The **FAULT** LED indicates the status of the automated Built In Test (BIT) functionality. If **FAULT** is illuminated, there exists some anomaly within the ECHO II, the fault code will be shown on the display. Refer to the Fault Isolation section of this manual for troubleshooting. Note that even if the FAULT LED is illuminated, the ECHO II Signal Conditioner is transmitting if the XMIT is illuminated or flashing.

6. **Brightness Control**: The **BRIGHTNESS** buttons are used to adjust the illumination intensity of the front panel of the ECHO II and to control the cable offset setting.

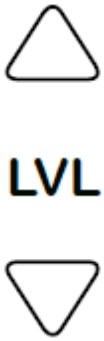
7. **Power Level Control**: The **POWER LEVEL** buttons are used to set the output power of the ECHO II and to set the Level Lock and Level Retention features.

8. **RS232 Port**: The **RS232 Port** is a serial interface for diagnosing and updating the firmware of the ECHO II.

7.1 Button Functions

The GLI-ECHO II has five buttons on the front panel. Use the buttons to turn the device on and off and to check or change unit settings.

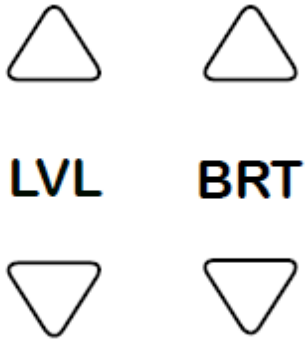
Button	Button Symbol	Function	Operation
Power		Turn on/off the unit.	To turn off the unit, hold the power button for three seconds. **NOTE:** The system will begin transmitting the GPS signals within 10 seconds if the system is fully operational. Although the System will begin transmitting within 10 seconds, it may require as much as 4 minutes to become fully initialized.

Button	Button Symbol	Function	Operation
ERP Signal Level Adjustment		Used to set the output power of the unit. The range of output power level adjustment is -85dBm to -65dBm.	**NOTE:** Raising the power level too much is counter-productive and can decrease signal reliability
		Used to Level Lock the unit. With Level Lock enabled, the Signal Level setting may not be changed by the operator.	**LEVEL LOCK:** Pressing and holding the LVL UP and LVL DN buttons simultaneously for 3 seconds allows user to lock the power level LVL buttons after selecting desired setting. Y = User power level is locked N = User power level is adjustable 3 seconds after last button press, the input is accepted and "REMLVL:?" is displayed Y = User set power level will persist after a system reset N = User set power level will be 0 after system reset 3 seconds after last button press, the input is accepted and system returns to normal operating mode
		Used to set Level Retention. With Level Retention enabled, the Signal Conditioner will remember the Signal Level setting through a power On/Off cycle.	**LEVEL RETENTION:** Press and hold the LVL UP and LVL DN buttons simultaneously for 3 seconds. "LVLLCK:?" will then be displayed. See Level Lock above for information on Level Lock setting. After a 3 second timeout, "REMLVL:?" will be displayed. The LVL buttons allow the user to select the desired setting. Setting "REMLVL:?" to "REMLVL:Y" will enable the Level Retention function. Setting "REMLVL:?" to "REMLVL:N" will disable the Level Retention function. User input will be saved after a 3 second timeout and will return to normal operating mode.

Button	Button Symbol	Function	Operation
Brightness Level Adjustment		Used to adjust the illumination intensity of the front panel of the unit.	**NOTE:** Depressing the down button beyond its lowest setting will turn off the user input panel lights; however, the unit will still operate.
		Used to insert cable offset in the event longer cables are used, the unit can compensate for the cable loss.	**CABLE OFFSET:** Pressing and holding the BRT UP and BRT DN buttons simultaneously for 3 seconds allows user to enter additional system gain to offset loss cables between the Signal Conditioner and the transmit antenna. "CBL OS:#" is displayed Use the BRT buttons to select desired setting 0 = no additional gain 1,2,3,4 or 5 = 1, 2, 3, 4, or 5 dB additional gain 3 seconds after last button press, the input is accepted and system returns to normal operating mode.

7.2 L2 Offset Mode

The unit can be set to lower its L2 signal in rare instances where the unit is oscillating on the L2 channel.

Buttons	Function	Operation
	Used to lower L2 signal. *In rare instances, L2 offset mode is useful as it may improve system performance if there is less system gain on L2. L2 signal is still available for use with offset.*	**L2 OFFSET:** Pressing and holding the BRT DN and LVL UP buttons simultaneously for 3 seconds allows user to change the offset between L1 and L2 signal "L2OS:-#" LVL buttons select desired setting 0 = no offset between L1 and L2 signals -5 (default) = L2 signal is -5dB -10 = L2 signal is -10dB 3 seconds after last button press, the input is accepted and system returns to normal operating mode

7.3 User Input Display, XMIT Light, and FAULT light

The GLI-ECHO II display will illuminate along with the user input buttons. The display indicates the power level/brightness level of the GLI-ECHO II. The display will also indicate any fault detected by the GLI-ECHO II.

If the FAULT light remains illuminated after the system has initialized, then revisit the system installation to ensure all system components have been properly installed/connected.

Feature	Function	Operation
Display	Indicates power level, brightness, and fault codes	See fault isolation section if fault is displayed and FAULT light illuminated.
XMIT Light	Indicates the transmit status	If XMIT is illuminated, the unit is transmitting the GPS signal through all operation antennas. If XMIT is flashing, the unit is transmitting and acquiring satellites.
FAULT Light	Indicates the status of the automated built in test (fault detection)	If FAULT is illuminated, there exists some anomaly in the unit. The fault will be displayed on the panel (see fault isolation section).

8.0 System Checkout

After installation in the aircraft/vehicle, it is necessary for the user to perform a system operation check to ensure that the system is powered on and operating properly.

Step	Instruction	
1.0	Ensure doors/ramps are closed so that GPS signals directly from the satellites from the outside of the aircraft/vehicle do not compromise the test of the ECHO II	
2.0	Enable system power.	
3.0	If using an ECHO II connected to an AEU/GAS1: Enable the aircraft navigation system so as to ensure that the AEU/GAS-1 is on and operational. (For COBRA Kits this is not recommended). ***OR*** If using an ECHO II connected to an active antenna: Ensure the aircraft is in a location with a clear view of the sky, so the active antenna can receive signal.	
4.0		Enable the ECHO II by pressing and holding the power button on the face of the ECHO II for 2 seconds until the display turns on. Wait 4 minutes, or until the "XMIT" LED is no longer flashing to ensure complete system initialization.

Step	Instruction	
5.0	When the XMIT light is solid, then use any handheld GPS receiver, position the receiver at all locations where GPS signal should be present and verify receiver operation and adequate signal level (Signal level is indicated in this case by number of satellites visible). System check has passed if the XMIT light is solid and the receiver is acquiring signal. Go to Step 6.0 If improper GPS receiver operation is noted, or if inadequate signal levels are observed, then verify that all installation steps have been completed correctly. If the FAULT light is illuminated on the ECHO II, then refer to the Fault Isolation section of this manual after verifying all installation steps. Note: With the 2.6" active antenna installed behind the aircraft windscreen the number of satellites visible will be a function of the aircraft's orientation and will be less than the number visible outside of the aircraft due to the active antenna's limited view of the sky.	
6.0		Remove power from the ECHO II by pressing and holding the power button on the face of the ECHO II for 4 seconds until the display turns off.
7.0	Remove system power.	

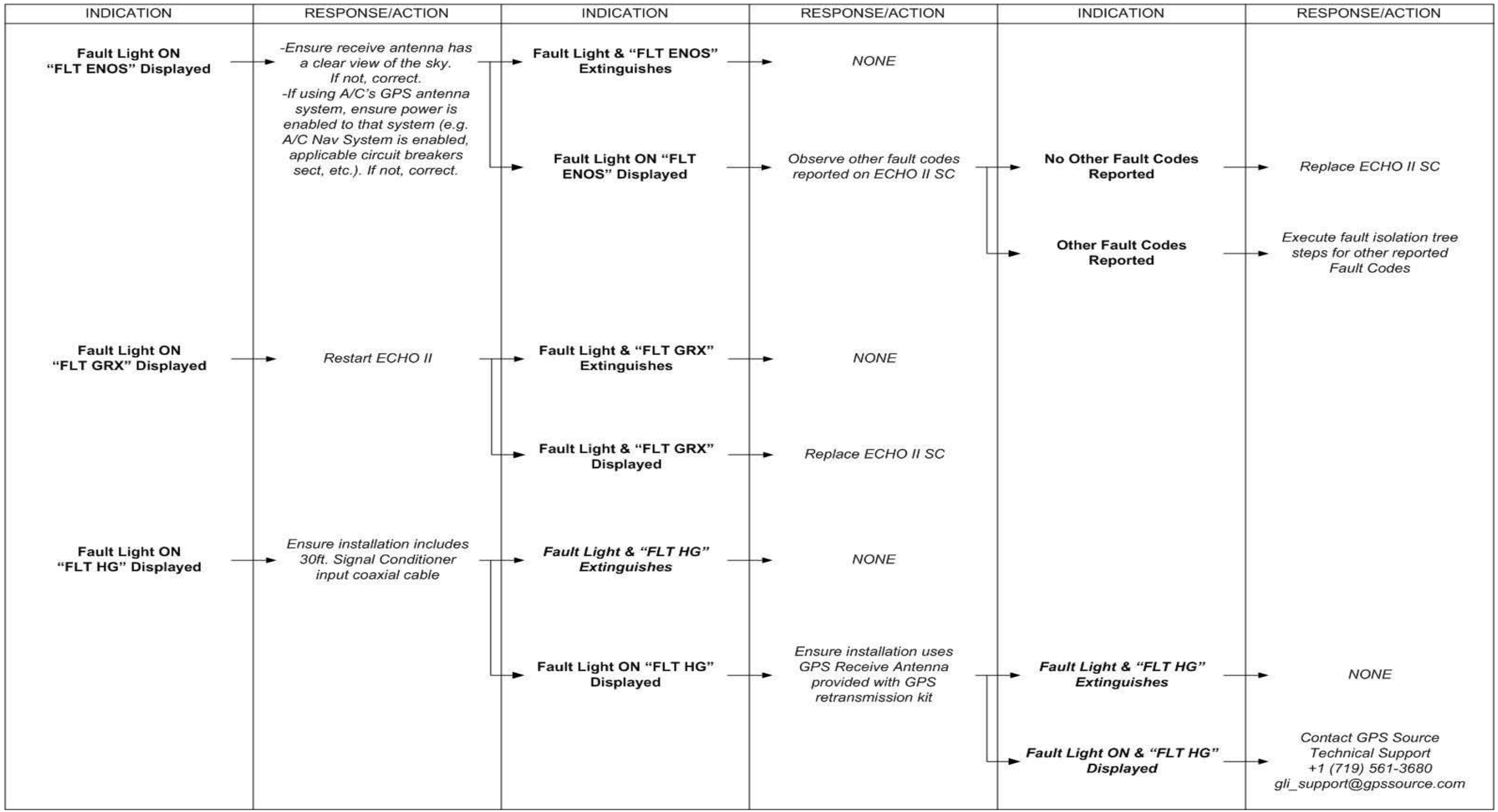
9.0 Fault Isolation

The following figures constitute a Fault Isolation Tree for use in isolating ECHO II system failures to specific system components. The Fault Isolation Tree includes columns titled “INDICATION/RESULT” and “RESPONSE/ACTION.” The columns titled “INDICATION/ RESULT” describe the failure being indicated by the unit or the response of the system to a specific troubleshooting action. The columns titled “RESPONSE/ACTION” indicate the response or action to be taken by the troubleshooter in response to a specific indication.

The table below is a list of the possible fault codes and an explanation of these codes that may be reported by the ECHOII. These codes, together with the fault isolation tree, assist the operator in troubleshooting the system.

Table 2: GLI-COBRA ECHO II Fault Code Definitions

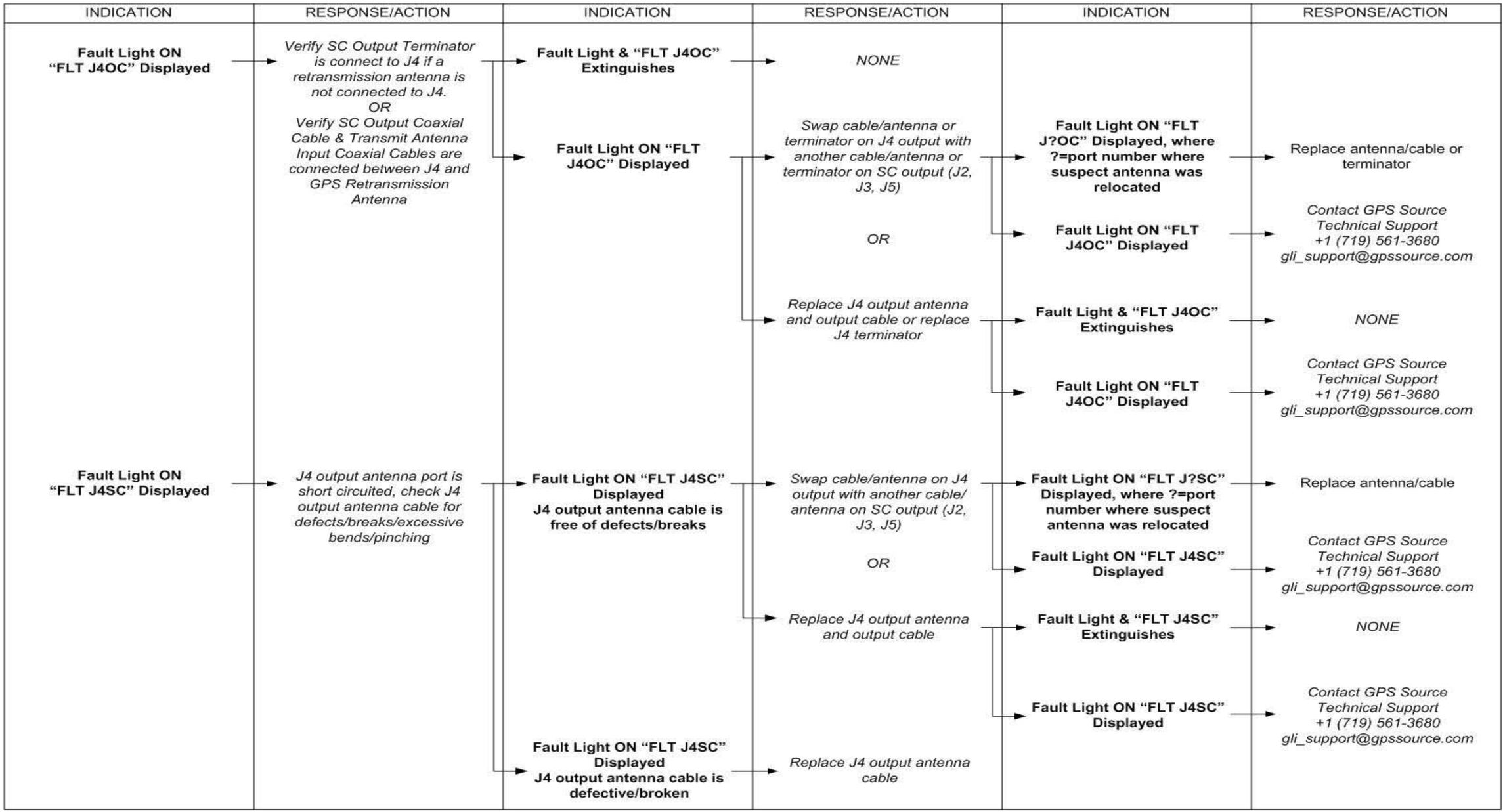
Fault Code	Description
“FLT ENOS”	No satellites with adequate signal received during the en route operation
“FLT GRX”	GPS Receiver failure
“FLT HG”	High Gain detected at the J1 input
“FLT J1OC”	J1 Open Circuit detected
“FLT J1SC”	J1 Short Circuit detected
“FLT J2OC”	J2 Open Circuit detected
“FLT J2SC”	J2 Short Circuit detected
“FLT J3OC”	J3 Open Circuit detected
“FLT J3SC”	J3 Short Circuit detected
“FLT J4OC”	J4 Open Circuit detected
“FLT J4SC”	J4 Short Circuit detected
“FLT J5OC”	J5 Open Circuit detected
“FLT J5SC”	J5 Short Circuit detected
“FLT LG”	Low Gain detected at the J1 input
“FLT LT4S”	Less than 4 satellites with adequate signal received after completion of initialization/acquisition
“FLT OC”	Oscillation Condition detected
“FLT PNOS”	No satellite with adequate signal received within 4 minutes from power on
“FLT RFL1”	Failure in the L1 RF path
“FLT RFL2”	Failure in the L2 RF path
“FLT SAOC”	GPS splitter failure
“FLT SASC”	GPS splitter failure
“RR LRU”	Non-recoverable system error detected

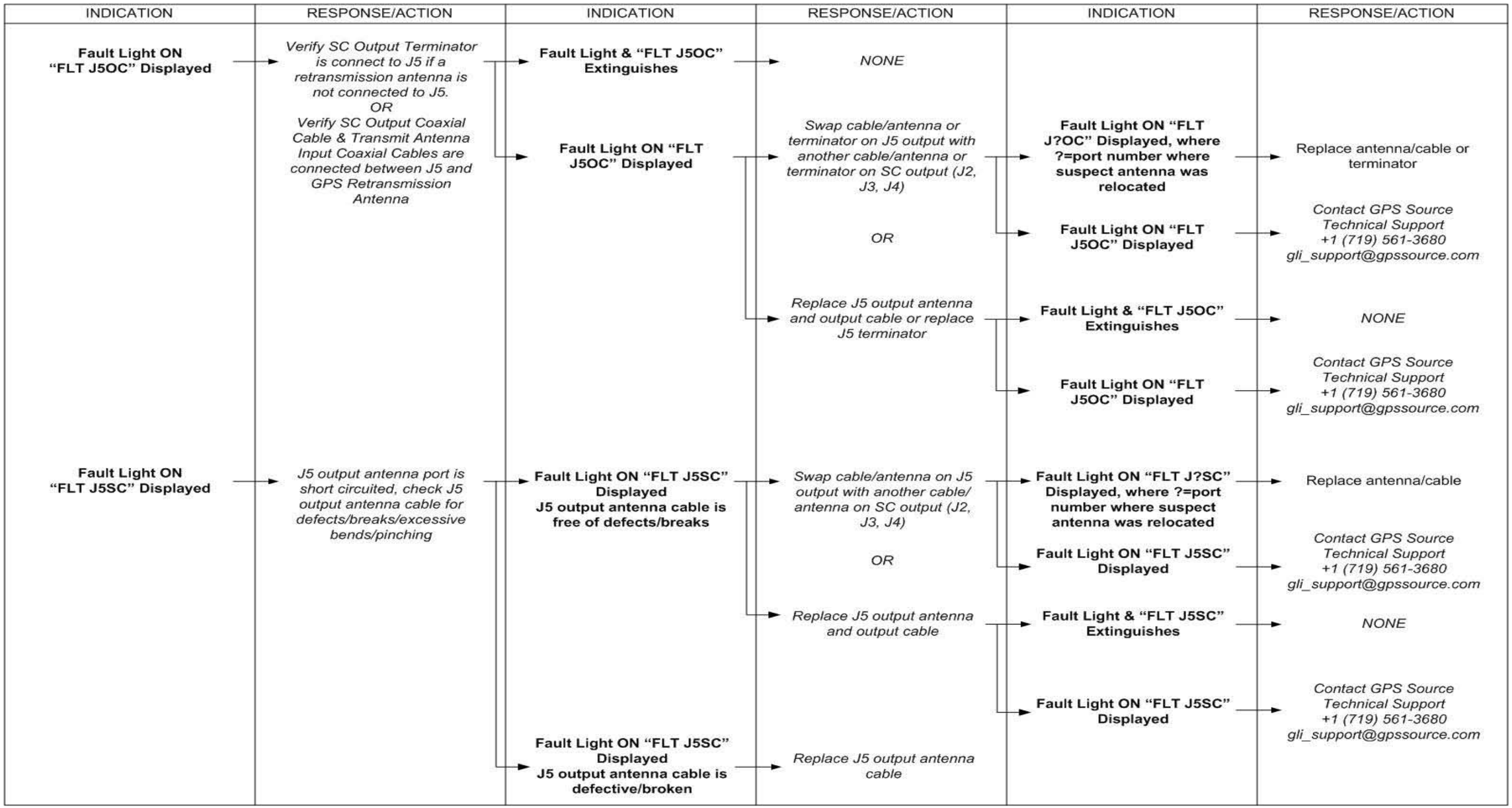

INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
Fault Light ON "FLT ENOS" Displayed
-Ensure receive antenna has a clear view of the sky. If not, correct.
-If using A/C's GPS antenna system, ensure power is enabled to that system (e.g. A/C Nav System is enabled, applicable circuit breakers sect, etc.). If not, correct.
Fault Light & "FLT ENOS" Extinguishes
NONE
Fault Light ON "FLT ENOS" Displayed
Observe other fault codes reported on ECHO II SC
No Other Fault Codes Reported
Replace ECHO II SC
Other Fault Codes Reported
Execute fault isolation tree steps for other reported Fault Codes
Fault Light ON "FLT GRX" Displayed
Restart ECHO II
Fault Light & "FLT GRX" Extinguishes
NONE
Fault Light & "FLT GRX" Displayed
Replace ECHO II SC
Fault Light ON "FLT HG" Displayed
Ensure installation includes 30ft. Signal Conditioner input coaxial cable
Fault Light & "FLT HG" Extinguishes
NONE
Fault Light ON "FLT HG" Displayed
Ensure installation uses GPS Receive Antenna provided with GPS retransmission kit
Fault Light & "FLT HG" Extinguishes
NONE
Fault Light ON & "FLT HG" Displayed
Contact GPS Source Technical Support
+1 (719) 561-3680
gli_support@gpssource.com

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT J1OC" Displayed	*Verify SC Input Coaxial Cable & Receive Antenna Output Coaxial Cable are connected between the GPS Receive Antenna & the ECHO II SC*	**Fault Light & "FLT J1OC" Extinguishes**	*NONE*		
		Fault Light ON "FLT J1OC" Displayed	*Inspect coaxial cables & verify cables and connectors are free of damage. Replace damaged coaxial cables*	**Fault Light & "FLT J1OC" Extinguishes**	*NONE*
				Fault Light ON "FLT J1OC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
Fault Light ON "FLT J1SC" Displayed	Inspect coaxial cables between the GPS Receive Antenna and SC J1 to verify cables & connectors are free of damage. Replace damaged coaxial cables	**Fault Light & "FLT J1SC" Extinguishes**	*NONE*		
		Fault Light ON "FLT J1SC" Displayed	*Replace GPS Receive Antenna*	**Fault Light & "FLT J1SC" Extinguishes**	*NONE*
				Fault Light ON "FLT J1SC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT J2OC" Displayed	*Verify SC Output Terminator is connect to J2 if a retransmission antenna is not connected to J2. OR Verify SC Output Coaxial Cable & Transmit Antenna Input Coaxial Cables are connected between J2 and GPS Retransmission Antenna*	**Fault Light & "FLT J2OC" Extinguishes**	*NONE*		
		Fault Light ON "FLT J2OC" Displayed	*Swap cable/antenna or terminator on J2 output with another cable/antenna or terminator on SC output (J3, J4, J5)*	**Fault Light ON "FLT J?OC" Displayed, where ?=port number where suspect antenna was relocated**	Replace antenna/cable or terminator
			OR	**Fault Light ON "FLT J2OC" Displayed**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
			Replace J2 output antenna and output cable or replace J2 terminator	**Fault Light & "FLT J2OC" Extinguishes**	*NONE*
				Fault Light ON "FLT J2OC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
Fault Light ON "FLT J2SC" Displayed	*J2 output antenna port is short circuited, check J2 output antenna cable for defects/breaks/excessive bends/pinching*	**Fault Light ON "FLT J2SC" Displayed J2 output antenna cable is free of defects/breaks**	*Swap cable/antenna on J2 output with another cable/ antenna on SC output (J3, J4, J5)*	**Fault Light ON "FLT J?SC" Displayed, where ?=port number where suspect antenna was relocated**	Replace antenna/cable
			OR	**Fault Light ON "FLT J2SC" Displayed**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
			Replace J2 output antenna and output cable	**Fault Light & "FLT J2SC" Extinguishes**	*NONE*
				Fault Light ON "FLT J2SC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
		Fault Light ON "FLT J2SC" Displayed J2 output antenna cable is defective/broken	*Replace J2 output antenna cable*		

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT J3OC" Displayed	*Verify SC Output Terminator is connect to J3 if a retransmission antenna is not connected to J3. OR Verify SC Output Coaxial Cable & Transmit Antenna Input Coaxial Cables are connected between J3 and GPS Retransmission Antenna*	**Fault Light & "FLT J3OC" Extinguishes**	*NONE*		
		Fault Light ON "FLT J3OC" Displayed	*Swap cable/antenna or terminator on J3 output with another cable/antenna or terminator on SC output (J2, J4, J5)*	**Fault Light ON "FLT J?OC" Displayed, where ?=port number where suspect antenna was relocated**	Replace antenna/cable or terminator
			OR	**Fault Light ON "FLT J3OC" Displayed**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
			Replace J3 output antenna and output cable or replace J3 terminator	**Fault Light & "FLT J3OC" Extinguishes**	*NONE*
				Fault Light ON "FLT J3OC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
Fault Light ON "FLT J3SC" Displayed	*J3 output antenna port is short circuited, check J3 output antenna cable for defects/breaks/excessive bends/pinching*	**Fault Light ON "FLT J3SC" Displayed J3 output antenna cable is free of defects/breaks**	*Swap cable/antenna on J3 output with another cable/ antenna on SC output (J2, J4, J5)*	**Fault Light ON "FLT J?SC" Displayed, where ?=port number where suspect antenna was relocated**	Replace antenna/cable
			OR	**Fault Light ON "FLT J3SC" Displayed**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
			Replace J3 output antenna and output cable	**Fault Light & "FLT J3SC" Extinguishes**	*NONE*
				Fault Light ON "FLT J3SC" Displayed	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
		Fault Light ON "FLT J3SC" Displayed J3 output antenna cable is defective/broken	*Replace J3 output antenna cable*		


INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
Fault Light ON "FLT J4OC" Displayed
Verify SC Output Terminator is connect to J4 if a retransmission antenna is not connected to J4.
OR
Verify SC Output Coaxial Cable & Transmit Antenna Input Coaxial Cables are connected between J4 and GPS Retransmission Antenna
Fault Light & "FLT J4OC" Extinguishes
NONE
Fault Light ON "FLT J4OC" Displayed
Swap cable/antenna or terminator on J4 output with another cable/antenna or terminator on SC output (J2, J3, J5)
OR
Replace J4 output antenna and output cable or replace J4 terminator
Fault Light ON "FLT J?OC" Displayed, where ?=port number where suspect antenna was relocated
Replace antenna/cable or terminator
Fault Light ON "FLT J4OC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light & "FLT J4OC" Extinguishes
NONE
Fault Light ON "FLT J4OC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light ON "FLT J4SC" Displayed
J4 output antenna port is short circuited, check J4 output antenna cable for defects/breaks/excessive bends/pinching
Fault Light ON "FLT J4SC" Displayed
J4 output antenna cable is free of defects/breaks
Swap cable/antenna on J4 output with another cable/ antenna on SC output (J2, J3, J5)
OR
Replace J4 output antenna and output cable
Fault Light ON "FLT J?SC" Displayed, where ?=port number where suspect antenna was relocated
Replace antenna/cable
Fault Light ON "FLT J4SC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light & "FLT J4SC" Extinguishes
NONE
Fault Light ON "FLT J4SC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light ON "FLT J4SC" Displayed
J4 output antenna cable is defective/broken
Replace J4 output antenna cable


INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
INDICATION
RESPONSE/ACTION
Fault Light ON "FLT J5OC" Displayed
Verify SC Output Terminator is connect to J5 if a retransmission antenna is not connected to J5.
OR
Verify SC Output Coaxial Cable & Transmit Antenna Input Coaxial Cables are connected between J5 and GPS Retransmission Antenna
Fault Light & "FLT J5OC" Extinguishes
NONE
Fault Light ON "FLT J5OC" Displayed
Swap cable/antenna or terminator on J5 output with another cable/antenna or terminator on SC output (J2, J3, J4)
OR
Replace J5 output antenna and output cable or replace J5 terminator
Fault Light ON "FLT J?OC" Displayed, where ?=port number where suspect antenna was relocated
Replace antenna/cable or terminator
Fault Light ON "FLT J5OC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light & "FLT J5OC" Extinguishes
NONE
Fault Light ON "FLT J5OC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light ON "FLT J5SC" Displayed
J5 output antenna port is short circuited, check J5 output antenna cable for defects/breaks/excessive bends/pinching
Fault Light ON "FLT J5SC" Displayed
J5 output antenna cable is free of defects/breaks
Swap cable/antenna on J5 output with another cable/ antenna on SC output (J2, J3, J4)
OR
Replace J5 output antenna and output cable
Fault Light ON "FLT J?SC" Displayed, where ?=port number where suspect antenna was relocated
Replace antenna/cable
Fault Light ON "FLT J5SC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light & "FLT J5SC" Extinguishes
NONE
Fault Light ON "FLT J5SC" Displayed
Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com
Fault Light ON "FLT J5SC" Displayed
J5 output antenna cable is defective/broken
Replace J5 output antenna cable

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT LG" Displayed	*Input antenna has too little gain, check installation and installation requirements*	**Installation is correct and input antenna/cable meets requirements**	*Replace input antenna and input cable, restart ECHO II*	**"FLT LG" remains**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
				"FLT LG" extinguished	*NONE*
		Installation is NOT correct or input antenna/cable DOES NOT meet the requirements	*Correct installation*		
Fault Light ON "FLT LT4S" Displayed	*Ensure input antenna has a clear view of the sky, restart system, and wait 4 minutes*	**Input antenna has a clear view of the sky, "FLT LT4S" still displayed**	*Check satellite signal using a hand-held GPS receiver outside of aircraft/vehicle*	**Hand-held GPS receiver is able to acquire >4 satellites**	*Replace input antenna/cable and restart system. If does not fix system, Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
				Hand-held GPS receiver is NOT able to acquire >4 satellites	*NONE, there is an issue with interference or view of the constellation from area*
		Input antenna does not have a clear view of the sky, "FLT LT4S" still displayed	*Correct installation*		
		"FLT LT4S" is extinguished	*NONE*		

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT OC" displayed XMIT light ON	*Unit will automatically lower the user set power level to try to fix oscillation condition*	**Unit reaches a certain level and clears fault code**	*NONE*		
		Unit is unable to correct oscillation condition, XMIT light is not illuminated, and "RR LRU" is displayed	*Refer to "RR LRU" fault section*		
		Unit is unable to correct oscillation condition, XMIT light is not illuminated, and "RR LRU" is NOT displayed	*Remove output antenna cables one at a time to see if oscillation goes away*	**"FLT OC" remains after all output antenna cables are removed**	*Contact GPS Source Technical Support +1 (719) 561-3680 gli_support@gpssource.com*
				"FLT OC" is extinguished after removing a specific output antenna cable	*Reposition output or input antenna and cables to better isolate them from one another and restart unit*
Fault Light ON "FLT PNOS" Displayed	*Ensure input antenna has a clear view of the sky and restart system*	**Input antenna has a clear view of the sky, "FLT PNOS" still displayed**	*Check satellite signal using a hand-held GPS receiver outside of aircraft/vehicle*	**Hand-held GPS receiver is able to acquire any satellites**	*Replace input antenna/cable and restart system*
				Hand-held GPS receiver is NOT able to acquire any satellites	*NONE, there is an issue with interference or view of the constellation from area*
		Input antenna does not have a clear view of the sky, "FLT PNOS" still displayed	*Correct installation*		
		"FLT PNOS" is extinguished	*NONE*		

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "FLT SAOC" Displayed	*Restart ECHO II SC, wait 4 minutes*	**Fault Light & "FLT SAOC" Extinguishes**	*NONE*		
		Fault Light ON "FLT SAOC" Displayed	*Replace ECHO II SC*		
Fault Light ON "FLT SASC" Displayed	*Restart ECHO II SC, wait 4 minutes*	**Fault Light & "FLT SASC" Extinguishes**	*NONE*		
		Fault Light ON "FLT SASC" Displayed	*Replace ECHO II SC*		
Fault Light ON "FLT RFL1" Displayed	*Restart ECHO II SC, wait 4 minutes*	**Fault Light & "FLT RFL1" Extinguishes**	*NONE*		
		Fault Light ON "FLT RFL1" Displayed	*Replace ECHO II SC*		
Fault Light ON "FLT RFL2" Displayed	*Restart ECHO II SC, wait 4 minutes*	**Fault Light & "FLT RFL2" Extinguishes**	*NONE*		
		Fault Light ON "FLT RFL2" Displayed	*Replace ECHO II SC*		

INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION	INDICATION	RESPONSE/ACTION
Fault Light ON "RR LRU" Displayed →	*Restart ECHO II SC, wait 4 minutes* →	**Fault Light & "RR LRU" Extinguishes** →	*NONE*		
		Fault Light ON "RR LRU" Displayed →	*Check satellite signal using a hand-held GPS receiver outside of aircraft/vehicle* →	**Hand-held GPS receiver is able to acquire any satellites** →	*Replace ECHO II SC*
			Hand-held GPS receiver is NOT able to acquire any satellites →	**NONE, there is an issue with interference in the area**	

10.0 Air Worthiness Certifications

The following are approvals of air worthiness of GLI Kits for the following aircraft and the contacts to confirm certification.

Aircraft	Contact Name	Number	Email
C-17 C130J C130E/H	Paul Renard US Army - 160th SOAR Systems Integration & Management Office (SIMO)	(270) 798-1968	paul.renard@soar.army.mil
CASA	TBD	TBD	TBD

10.1 C-17 AMC:

PAGE 1 OF 2

MODIFICATION PROPOSAL

PART I - REQUEST FOR ACTION DATE: 20110530

1. INITIATOR	2. INITIATOR'S POC ORGANIZATION	3. USING COMMAND HQ POINT OF CONTACT
RDNS-WPA-T (Sanjay Patel) US Army Natick Soldier RDEC Kansas St. Natick, MA 01760 DSN 256-4083	AMC TES/OL-A (MSgt Marc Martindale) Natick Soldier Center USAF Liaison Kansas St Natick, MA 01760 DSN 256-6314	HQ AMC/TE (Mr. Stephen Chicosky) 402 Scott Drive Unit 1A5 Scott AFB, IL 62225-5364 DSN 779-2044

4. TITLE:
GLI-ECHO II GPS Retransmission System and ECHO II Based Temporary Mission Kits(COBRA,VIPER,DIAMONDBACK)

5. ORGANIZATION CONTROL NUMBER	6. OTHER NUMBERS

7. AFFECTED CONFIGURED ITEM/SYSTEM:

A. MDS/TMS/CEIL/CPIN	B. WUC	C. NSN
C-17		
D. SRD CODE	**E. NOUN**	**F. OTHER**

8. PURPOSE *(State the need or deficiency to be corrected. Include expected results.)*
US Army Special Operations Command operates GPS enabled mission specific equipment during the course of tactical operations and training. This equipment does not operate within the cargo compartment of the C-17 due to the airframe blockage of the native GPS satellite signals. USASOC requires authorization to operate on the C-17 a small, light-weight temporary install GPS retransmission mission kit that has demonstrated compatibility with the USASOC GPS equipment and that has demonstrated compatibility with the avionics equipment of all host aircraft from which the USASOC operate and train. The GLI-ECHO II GPS retransmission system will provide GPS signals to all GPS receivers operating within a localized area within the C-17

9. IMPACT *(Urgency of need and impact if not satisfied.)*
Insertion of US Army Special Operations Command forces, via HAHO or HALO, and paired insertions including SOF parachutists together with precision guided payload (e.g. JPADS), require the operation of GPS guidance equipment inside of the aircraft prior to deployment. This is necessary in order to verify the proper operation of all GPS equipment prior to deployment, to verify deployment will occur within mission specific parameters (e.g. location, airspeed, altitude, etc.), and to ensure that the GPS equipment can perform its intended function immediately upon deployment from the aircraft (i.e. performance is not delayed by prolonged "Time To First Fix" (TTFF)). The GLI-ECHO II GPS retransmission system will provide L1 & L2 C/A, P(Y) and M code GPS signals to all GPS receivers operating within a localized area within the C-17, enabling proper operation of all GPS equipment prior to throughout deployment.

10. CONSTRAINTS/ASSUMPTIONS/PROPOSED SOLUTIONS
EMI/EMC testing according to MIL-STD-461F has been completed and passed for the C-17A aircraft. Environmental testing according to MIL-STD-810G has been completed and passed for the C-17A aircraft. A copy of all certifications will be provided. The GLI-ECHO II GPS Retransmission Sys and temporary install mission kits (GLI-COBRA, GLI-VIPER, GLI-DIAMONDBACK) include the ECHO II GPS Retransmission Signal Conditioner, a GPS receive antenna (use is optional on the C-17 as the signal source will be the AEU/GAS-1 J4 MCR output), GPS retransmission antennas, coaxial cabling, BA5590 power cable, and mounting hardware. The GPS retransmission system is designed for temporary "Roll-on/Roll-off" installation, resulting in no permanent modification or damage to the aircraft. The system is design for installation and removal in less than 30 minutes. The system emits the GPS L1/L2 signals at EIRP levels of approximately -74dBm, which quickly decay within 10 to 15 ft to levels consistent with the native GPS signals outside of the aircraft (-130dBm). Measurements have also been provided to demonstrate that the total ECHO II GPS re-radiator system group delay does not exceed 200 nsec. An Operator's & Installation Manual will be provided to include detailed GLI-ECHO II operating instructions and detailed installation instructions for the ECHO II temporary mission kits.

11. ORGANIZATION VALIDATION DATE RECEIVED:

☒ A. PROPOSED REQUEST IS VALIDATED AS AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.

D. DATE	E. NAME, GRADE, TITLE, and DSN *(Type or Print)*	F. SIGNATURE
20110705	Mr. Stephen Chicosky, GS-12 779-2044 Test Manager	

AF FORM 1067, 19991101, V2 PREVIOUS EDITIONS ARE OBSOLETE.

PAGE 2 OF 2

PART II - USING COMMAND VALIDATION — DATE RECEIVED:

12. USING COMMAND VALIDATION

☒ A. PROPOSED REQUEST IS VALIDATED AS AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.

☐ D. FORWARD TO LEAD COMMAND — E. USING COMMAND CONTROL NO.

F. DATE	G. NAME, GRADE, TITLE, and DSN (Type or Print)	H. SIGNATURE
20110705	Gregory O. Blanchard, GS-13 779-2040 Chief, Policy and Resource Division	Greg Blanchard

PART III - LEAD COMMAND VALIDATION — DATE RECEIVED:

13. LEAD COMMAND ACTION OFFICER	14. THRU (Optional Routing)	15. SINGLE MANAGER OFFICE
Stephen Chicosky 229-2044		

16. MODIFICATION TYPE ☐ T-1 ☒ T-2 ☐ PERMANENT (P) ☐ P(S)-SAFETY — 17. LEAD COMMAND CONTROL NO. AMC 11424

18. LEAD COMMAND REMARKS (Identify any constraints or assumptions)

19. LEAD COMMAND VALIDATION

☒ A. VALIDATED REQUEST ☐ B. DISAPPROVED

20. NAME, GRADE, TITLE, AND DSN (Type or Print)	21. SIGNATURE	22. DATE
GARY J. NOLAN, Colonel, USAF Deputy Director of Logistics	Gary J. Nolan	JAN 19 2011

PART IV - SINGLE MANAGER REVIEW AND APPROVAL — DATE RECEIVED:

23. SM ACTION OFFICER	24. CENTER CONTROL NUMBERS	25. TOTAL BP/EEIC:			
		Type Funds	Amount	Type Funds	Amount
	A. CENTER MIP NO:				
	B. ECP NO:				
	C. TCTO NO:				

26. NR OF CIS AFFECTED: — 27. TOTAL KITS NEEDED:

28. ALSO AFFECTS: ☐ SUPPORT EQUIP ☐ AIRCREW TRAINING ☐ TRAINING DEVICES/VISUAL AIDS (Maint) ☐ TECH DATA ☐ SPARES ☐ SOFTWARE ☐ OTHER (Identify)

29. KIT OR UNIT COST	30. TOTAL COST	31. LEAD TIME	32. INSTALLATION (Begin) (Completed)

33. LEVEL OF ACCOMPLISHMENT. ☐ USER ☐ DEPOT ☐ BOTH ☐ OTHER

34. USER WORK HOURS — 35. DEPOT WORK HOURS: — 36. TOTAL WORK HOURS:

37. MANUFACTURER: — 38. AIRCRAFT BREAKOUT:

39. ENGINEERING REVIEW RECOMMENDATION(S)

See attached

☒ APPROVED ☐ DISAPPROVED (See attached remarks)

40. NAME, GRADE, TITLE, AND DSN (Type or Print)	41. SIGNATURE	42. DATE
William Mejias, GS-15, Chief Engineer DSN 785-2189 C-17 Division	William Mejias	1/23/12

PART V - LEAD COMMAND CERTIFICATION/APPROVAL

☒ TEMPORARY MOD APPROVED ☐ PERMANENT MOD APPROVED (Proceed to Budgeting)

☐ MOD DISAPPROVED ☐ MNS/ORD TO BE DEVELOPED

43. NAME, GRADE, TITLE, AND DSN (Type or Print)	44. SIGNATURE	45. DATE
Gregory O. Blanchard GS-14 779-2040 Deputy Director	Greg Blanchard	25 Jan 12

AF FORM 1067, 19991101, V2 (REVERSE)

10.2 C-130J

PAGE 1 OF 2

MODIFICATION PROPOSAL

PART I - REQUEST FOR ACTION DATE: 20110530

1. INITIATOR	2. INITIATOR'S POC ORGANIZATION	3. USING COMMAND HQ POINT OF CONTACT
RDNS-WPA-T (Sanjay Patel) US Army Natick Soldier RDEC Kansas St. Natick, MA 01760 DSN 256-4083	AMC TES/OL-A (MSgt Marc Martindale) Natick Soldier Center USAF Liaison Kansas St Natick, MA 01760 DSN 256-6314	HQ AMC/TE (Mr. Stephen Chicosky) 402 Scott Drive Unit 1A5 Scott AFB, IL 62225-5364 DSN 779-2044

4. TITLE:
GLI-ECHO II GPS Retransmission System and ECHO II Based Temporary Mission Kits(COBRA,VIPER,DIAMONDBACK)

5. ORGANIZATION CONTROL NUMBER	6. OTHER NUMBERS

7. AFFECTED CONFIGURED ITEM/SYSTEM:

A. MDS/TMS/CEIL/CPIN	B. WUC	C. NSN
C-130J		
D. SRD CODE	**E. NOUN**	**F. OTHER**

8. PURPOSE *(State the need or deficiency to be corrected. Include expected results.)*
US Army Special Operations Command operates GPS enabled mission specific equipment during the course of tactical operations and training. This equipment does not operate within the cargo compartment of the C-130 due to the airframe blockage of the native GPS satellite signals. USASOC requires authorization to operate on the C-130 a small, light-weight temporary install GPS retransmission mission kit that has demonstrated compatibility with the USASOC GPS equipment and that has demonstrated compatibility with the avionics equipment of all host aircraft from which the USASOC operate and train. The GLI-ECHO II GPS retransmission system will provide GPS signals to all GPS receivers operating within a localized area within the C-130

9. IMPACT *(Urgency of need and impact if not satisfied.)*
Insertion of US Army Special Operations Command forces, via HAHO or HALO, and paired insertions including SOF parachutists together with precision guided payload (e.g. JPADS), require the operation of GPS guidance equipment inside of the aircraft prior to deployment. This is necessary in order to verify the proper operation of all GPS equipment prior to deployment, to verify deployment will occur within mission specific parameters (e.g. location, airspeed, altitude, etc.), and to ensure that the GPS equipment can perform its intended function immediately upon deployment from the aircraft (i.e. performance is not delayed by prolonged "Time To First Fix" (TTFF)). The GLI-ECHO II GPS retransmission system will provide L1 & L2 C/A, P(Y) and M code GPS signals to all GPS receivers operating within a localized area within the C-130, enabling proper operation of all GPS equipment prior to throughout deployment.

10. CONSTRAINTS/ASSUMPTIONS/PROPOSED SOLUTIONS
EMI/EMC testing according to MIL-STD-461F has been completed and passed for the C-130 aircraft. Environmental testing according to MIL-STD-810G has been completed and passed for the C-130 aircraft. A copy of all certifications will be provided. The GLI-ECHO II GPS Retransmission Sys and temporary install mission kits (GLI-COBRA, GLI-VIPER, GLI-DIAMONDBACK) include the ECHO II GPS Retransmission Signal Conditioner, a GPS receive antenna (use is optional on the C-17 as the signal source will be the AEU/GAS-1 J4 MCR output), GPS retransmission antennas, coaxial cabling, BA5590 power cable, and mounting hardware. The GPS retransmission system is designed for temporary "Roll-on/Roll-off" installation, resulting in no permanent modification or damage to the aircraft. The system is design for installation and removal in less than 30 minutes. The system emits the GPS L1/L2 signals at EIRP levels of approximately -74dBm, which quickly decay within 10 to 15 ft to levels consistent with the native GPS signals outside of the aircraft (-130dBm). Measurements have also been provided to demonstrate that the total ECHO II GPS re-radiator system group delay does not exceed 200 nsec. An Operator's & Installation Manual will be provided to include detailed GLI-ECHO II operating instructions and detailed installation instructions for the ECHO II temporary mission kits.

11. ORGANIZATION VALIDATION DATE RECEIVED:

☒ A. PROPOSED REQUEST IS VALIDATED AS AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.

D. DATE	E. NAME, GRADE, TITLE, and DSN *(Type or Print)*	F. SIGNATURE
20110705	Mr. Stephen Chicosky, GS-12 779-2044 Test Manager	

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PART II - USING COMMAND VALIDATION — DATE RECEIVED:

12. USING COMMAND VALIDATION

- [X] A. PROPOSED REQUEST IS VALIDATED AS AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.
- [ ] B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.
- [ ] C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.
- [ ] D. FORWARD TO LEAD COMMAND — E. USING COMMAND CONTROL NO.

F. DATE	G. NAME, GRADE, TITLE, and DSN (Type or Print)	H. SIGNATURE
20110705	Gregory O. Blanchard, GS-13 779-2040 Chief, Policy and Resource Division	Greg Blanchard

PART III - LEAD COMMAND VALIDATION — DATE RECEIVED:

13. LEAD COMMAND ACTION OFFICER	14. THRU (Optional Routing)	15. SINGLE MANAGER OFFICE
Stephen Chicosky 229-2044		

16. MODIFICATION TYPE: [ ] T-1 [X] T-2 [ ] PERMANENT (P) [ ] P(S)-SAFETY — 17. LEAD COMMAND CONTROL NO.: AMC 11-125

18. LEAD COMMAND REMARKS (Identify any constraints or assumptions)

19. LEAD COMMAND VALIDATION

- [X] A. VALIDATED REQUEST
- [ ] B. DISAPPROVED

20. NAME, GRADE, TITLE, AND DSN (Type or Print)	21. SIGNATURE	22. DATE
GARY J. NOLAN, Colonel, USAF Deputy Director of Logistics		JUL 19 2011

PART IV - SINGLE MANAGER REVIEW AND APPROVAL — DATE RECEIVED:

23. SM ACTION OFFICER	24. CENTER CONTROL NUMBERS	25. TOTAL BP/EEIC:			
		Type Funds	Amount	Type Funds	Amount
George Bostic WR-ALC/GRBCC DSN 497-3063	A. CENTER MIP NO:				
	B. ECP NO:				
	C. TCTO NO:				

26. NR OF CIS AFFECTED: — 27. TOTAL KITS NEEDED:

28. ALSO AFFECTS: [ ] SUPPORT EQUIP [ ] AIRCREW TRAINING [ ] TRAINING DEVICES/VISUAL AIDS (Main) [ ] TECH DATA [ ] SPARES [ ] SOFTWARE [ ] OTHER (Identify)

29. KIT OR UNIT COST	30. TOTAL COST	31. LEAD TIME	32. INSTALLATION (Begin) (Completed)

33. LEVEL OF ACCOMPLISHMENT: [ ] USER [ ] DEPOT [ ] BOTH. [ ] OTHER

34. USER WORK HOURS	35. DEPOT WORK HOURS:	36. TOTAL WORK HOURS:

37. MANUFACTURER: — 38. AIRCRAFT BREAKOUT:

39. ENGINEERING REVIEW RECOMMENDATION(S)

This mod is not approved for installation or use on ANP modified aircraft.
An AFMC 273 Final Release for Flight approved by this office is required before this proposed modification is authorized for flight.
Loadmaster shall verify installation of GLI-ECHO II per GLI-ECHO user's manual.
Loadmaster shall verify center of gravity with GLI-ECHO II kit installed.
The wire routing will be verified and documented.

- [X] APPROVED
- [ ] DISAPPROVED (See attached remarks)

40. NAME, GRADE, TITLE, AND DSN (Type or Print)	41. SIGNATURE	42. DATE
John W. Sawyer, LtCol, USAF, DSN 468-2322 Deputy Director, TAD, WR-ALC/GRB		1/10/2012

PART V - LEAD COMMAND CERTIFICATION/APPROVAL

- [ ] TEMPORARY MOD APPROVED
- [ ] PERMANENT MOD APPROVED (Proceed to Budgeting)
- [ ] MOD DISAPPROVED
- [ ] MNS/ORD TO BE DEVELOPED

43. NAME, GRADE, TITLE, AND DSN (Type or Print)	44. SIGNATURE	45. DATE
Gregory O. Blanchard, Dep Dir, GS-14 779-2046	Greg Blanchard	18 Jan 2012

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10.3 C-130E/H

PAGE 1 OF 2

MODIFICATION PROPOSAL

PART I - REQUEST FOR ACTION DATE: 20110530

1. INITIATOR	2. INITIATOR'S POC ORGANIZATION	3. USING COMMAND HQ POINT OF CONTACT
RDNS-WPA-T (Sanjay Patel) US Army Natick Soldier RDEC Kansas St. Natick, MA 01760 DSN 256-4083	AMC TES/OL-A (MSgt Marc Martindale) Natick Soldier Center USAF Liaison Kansas St Natick, MA 01760 DSN 256-6314	HQ AMC/TE (Mr. Stephen Chicosky) 402 Scott Drive Unit 1A5 Scott AFB, IL 62225-5364 DSN 779-2044

4. TITLE:
GLI-ECHO II GPS Retransmission System and ECHO II Based Temporary Mission Kits(COBRA,VIPER,DIAMONDBACK)

5. ORGANIZATION CONTROL NUMBER	6. OTHER NUMBERS

7. AFFECTED CONFIGURED ITEM/SYSTEM:

A. MDS/TMS/CEIL/CPIN	B. WUC	C. NSN
C-130E/H		
D. SRD CODE	**E. NOUN**	**F. OTHER**

8. PURPOSE *(State the need or deficiency to be corrected. Include expected results.)*
US Army Special Operations Command operates GPS enabled mission specific equipment during the course of tactical operations and training. This equipment does not operate within the cargo compartment of the C-130 due to the airframe blockage of the native GPS satellite signals. USASOC requires authorization to operate on the C-130 a small, light-weight temporary install GPS retransmission mission kit that has demonstrated compatibility with the USASOC GPS equipment and that has demonstrated compatibility with the avionics equipment of all host aircraft from which the USASOC operate and train. The GLI-ECHO II GPS retransmission system will provide GPS signals to all GPS receivers operating within a localized area within the C-130

9. IMPACT *(Urgency of need and impact if not satisfied.)*
Insertion of US Army Special Operations Command forces, via HAHO or HALO, and paired insertions including SOF parachutists together with precision guided payload (e.g. JPADS), require the operation of GPS guidance equipment inside of the aircraft prior to deployment. This is necessary in order to verify the proper operation of all GPS equipment prior to deployment, to verify deployment will occur within mission specific parameters (e.g. location, airspeed, altitude, etc.), and to ensure that the GPS equipment can perform its intended function immediately upon deployment from the aircraft (i.e. performance is not delayed by prolonged "Time To First Fix" (TTFF)). The GLI-ECHO II GPS retransmission system will provide L1 & L2 C/A, P(Y) and M code GPS signals to all GPS receivers operating within a localized area within the C-130, enabling proper operation of all GPS equipment prior to throughout deployment.

10. CONSTRAINTS/ASSUMPTIONS/PROPOSED SOLUTIONS
EMI/EMC testing according to MIL-STD-461F has been completed and passed for the C-130 aircraft. Environmental testing according to MIL-STD-810G has been completed and passed for the C-130 aircraft. A copy of all certifications will be provided. The GLI-ECHO II GPS Retransmission Sys and temporary install mission kits (GLI-COBRA, GLI-VIPER, GLI-DIAMONDBACK) include the ECHO II GPS Retransmission Signal Conditioner, a GPS receive antenna (use is optional on the C-17 as the signal source will be the AEU/GAS-1 J4 MCR output), GPS retransmission antennas, coaxial cabling, BA5590 power cable, and mounting hardware. The GPS retransmission system is designed for temporary "Roll-on/Roll-off" installation, resulting in no permanent modification or damage to the aircraft. The system is design for installation and removal in less than 30 minutes. The system emits the GPS L1/L2 signals at EIRP levels of approximately -74dBm, which quickly decay within 10 to 15 ft to levels consistent with the native GPS signals outside of the aircraft (-130dBm). Measurements have also been provided to demonstrate that the total ECHO II GPS re-radiator system group delay does not exceed 200 nsec. An Operator's & Installation Manual will be provided to include detailed GLI-ECHO II operating instructions and detailed installation instructions for the ECHO II temporary mission kits.

11. ORGANIZATION VALIDATION DATE RECEIVED:

☒ A. PROPOSED REQUEST IS VALIDATED AS AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.

D. DATE	E. NAME, GRADE, TITLE, and DSN *(Type or Print)*	F. SIGNATURE
20110705	Mr. Stephen Chicosky, GS-12 779-2044 Test Manager	

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PAGE 2 OF 2

PART II - USING COMMAND VALIDATION — DATE RECEIVED:

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☐ B. PROPOSED REQUEST IS DISAPPROVED AND IS NOT AN ORGANIZATION NEED/REQUIREMENT WHICH REQUIRES ACTION.

☐ C. PROPOSED REQUEST IS RETURNED TO SUBMITTER FOR ADDITIONAL INFORMATION.

☐ D. FORWARD TO LEAD COMMAND — E. USING COMMAND CONTROL NO.

F. DATE	G. NAME, GRADE, TITLE, and DSN (Type or Print)	H. SIGNATURE
20110705	Gregory O. Blanchard, GS-13 779-2040 Chief, Policy and Resource Division	Greg Blanchard

PART III - LEAD COMMAND VALIDATION — DATE RECEIVED:

13. LEAD COMMAND ACTION OFFICER	14. THRU (Optional Routing)	15 SINGLE MANAGER OFFICE
Stephen Chicosky 229-2044		

16. MODIFICATION TYPE ☐ T-1 ☒ T-2 ☐ PERMANENT (P) ☐ P(S)-SAFETY — 17. LEAD COMMAND CONTROL NO. AMC 11-126

18. LEAD COMMAND REMARKS (Identify any constraints or assumptions)

19. LEAD COMMAND VALIDATION

☒ A. VALIDATED REQUEST ☐ B. DISAPPROVED

20. NAME, GRADE, TITLE, AND DSN (Type or Print)	21. SIGNATURE	22. DATE
GARY J. NOLAN, Colonel, USAF Deputy Director of Logistics	Gary J. Nolan	JUL 19 2011

PART IV - SINGLE MANAGER REVIEW AND APPROVAL — DATE RECEIVED:

23. SM ACTION OFFICER	24. CENTER CONTROL NUMBERS	25. TOTAL BP/EEIC:			
		Type Funds	Amount	Type Funds	Amount
Carl Ruffin WR-ALC/GRBCCB DSN 468-4649	A. CENTER MIP NO:				
	B. ECP NO:				
	C. TCTO NO:				

26. NR OF C/S AFFECTED: — 27. TOTAL KITS NEEDED:

28. ALSO AFFECTS: ☐ SUPPORT EQUIP ☐ AIRCREW TRAINING ☐ TRAINING DEVICES/VISUAL AIDS (Maint) ☐ TECH DATA ☐ SPARES ☐ SOFTWARE ☐ OTHER (Identify)

29. KIT OR UNIT COST	30. TOTAL COST	31. LEAD TIME	32. INSTALLATION (Begin) (Completed)

33. LEVEL OF ACCOMPLISHMENT. ☐ USER ☐ DEPOT ☐ BOTH ☐ OTHER

34. USER WORK HOURS	35. DEPOT WORK HOURS:	36. TOTAL WORK HOURS:

37. MANUFACTURER: — 38. AIRCRAFT BREAKOUT:

39. ENGINEERING REVIEW RECOMMENDATION(S)

This mod is not approved for installation or use on AMP modified aircraft.
An AFMC 273 Final Release for Flight approved by this office is required before this proposed modification is authorized for flight.
Loadmaster shall verify installation of GLI-ECHO II per GLI-ECHO II user's manual.
Loadmaster shall verify center of gravity with GLI-ECHO II kit installed.
The wire routing will be verified and documented.

☒ APPROVED ☐ DISAPPROVED (See attached remarks)

40. NAME, GRADE, TITLE, AND DSN (Type or Print)	41. SIGNATURE	42. DATE
John W. Sawyer, LtCol, USAF, DSN 468-2322 Deputy Director, TAD, WR-ALC/GRB	John W. Sawyer	1/10/2012

PART V - LEAD COMMAND CERTIFICATION/APPROVAL

☐ TEMPORARY MOD APPROVED ☐ PERMANENT MOD APPROVED (Proceed to Budgeting)

☐ MOD DISAPPROVED ☐ MNS/ORD TO BE DEVELOPED

43. NAME, GRADE, TITLE, AND DSN (Type or Print)	44. SIGNATURE	45. DATE
Gregory O. Blanchard Dep Dir GS14 779-2046	Greg Blanchard	18 Jan 2012

AF FORM 1067, 19991101, V2 (REVERSE)